

Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

"Music Box"

That smart contemporary of ours, *The New Yorker*, reports a little incident dealing with the uncertainties of construction in foreign lands. An American engineer was sent to Spain to take charge of a road-building project. The natives had little interest in the job and a rather impractical attitude toward any kind of work, it seemed, and things went distressingly slow. He hopefully looked forward to the arrival of an American concrete mixer to catch up with the construction schedule. It finally arrived, and was assembled and set in operation but its first effect was the opposite of what he had hoped. The moment it started, the native laborers all threw down their tools and began to dance to its cadence, quite deliriously.

Death Flew 800 Feet

A construction camp dining room seems like a safe place. And so assumed a workman recently who, when strolling innocently to his noon-day meal at the camp dining room, located near a dam under construction, was suddenly killed. Death in the form of a rock hurled by the terrific force of a dynamite blast flew 800 feet to claim him.

When the warning alarm for a blast is sounded, everyone in the vicinity, without exception and including those who may think that they are in a reasonably safe spot, should be required to get into a really safe shelter. Such sad experiences as the one above prove the necessity for such a safety measure.

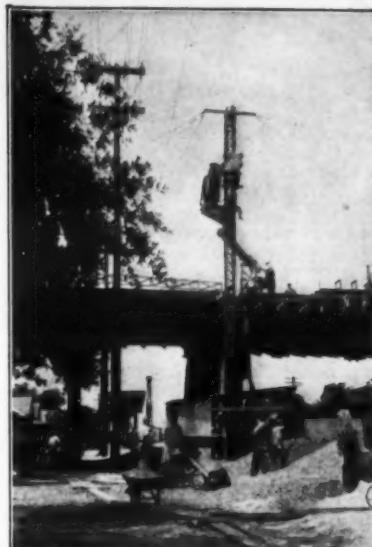
Guard Rail in Latin America

In view of the recent discussions and newspaper articles on the Pan-American Highway, and the proposed plans for the formal opening of that section of the highway from Laredo, Texas, to Mexico City next fall, it would seem an opportune time for the manufacturers of safety highway guard rail to

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C. & E. M. Photo
Concreting Plant for New Viaduct at Pensacola, Fla. See page 19

Federal Appropriation for Highways

After weeks of delay, the Emergency Relief Bill carrying the Hayden-Cartwright Amendment has been passed by Congress and signed by President Roosevelt.

As the bill now stands, \$800,000,000 is earmarked for highways and grade crossing elimination. Although President Roosevelt may vary the amount earmarked by 20 per cent, the A.R.B.A. believes that the amount stipulated will be used, probably \$500,000,000 for roads and \$300,000,000 for grade crossing elimination.

Experimental Surface on Sand-Clay Base

A DISTINCTLY new type of surfacing for main highway use was successfully built by the State Highway Department of Mississippi last summer. A firm traffic-compacted base or foundation with a thin but well-bonded wearing course was secured by using selected sand clay for the base primed with tar and binding the surface gravel with asphalt emulsion.

The section, 7.111 miles in length, selected for the experiment had been graded three years before and therefore had set up well. The contractor, Barber Bros. Contracting Co., of Baton Rouge, La., put in the new rough grade with a dragline, using a Northwest with a 40-foot boom and a 1-yard Page bucket. The ditches had to be recut and the slopes flattened from 1:1 to 3:1 under the new specifications. This was followed with mules and fresnos and a hand outfit dressing all back slopes and ditches and cutting the sub-grade on the crown to within 1 inch of the finished grade. This work was followed at once by the sodding crew to protect the slopes from wash. Work was started March 31, 1934 and the hauling of material for the base course began a short time later.

Concrete Pipe Made and Laid in Ten Days

(Photo on page 40)

WITH all the precision of the production line of an automobile factory, the Lock Joint Pipe Co. accepted delivery of raw materials at its temporary plant at Braley's Station, Mass., and each day rolled out twenty-four 12-foot lengths of 48-inch concrete pipe as part of its 19,000-foot contract for a new water supply line for the City of New Bedford, Mass. With equal facility, a truck equipped with special body backed into a pit at the plant and carried away one after another of the sections of cured pipe, while a power shovel dug the trench, laid the pipe and backfilled as it went along.

Under its rating as a manufacturer of concrete pipe, the contractor was not required to employ local labor through the Federal Reemployment Service. On the other hand, this contractor having always featured the use of local labor, and believing in the use of the accepted central employment agency in the locality, the cooperation of the local F.R.S. official was sought and enthusiastically given.

The Plant Location

The contractor set up his concrete pipe manufacturing plant at Braley's Station, 8 miles from the center of New Bedford

Barber Bros. Used Tar and Asphalt Emulsion on 7.1-Mile Section near Hattiesburg, Miss.

Preparing the Base

The contract called for a selected sand-clay base 22 feet wide with a 20-foot roadway and shoulders of selected material, 4 feet wide, on either side. The borrow for the base course was from three pits designated by the State and amounted to 25,000 cubic yards, with an average haul of about 2 miles. This was all handled by a fleet of five Mack and two International trucks supplemented by four hired trucks. These were loaded by a Northwest $\frac{3}{4}$ -yard shovel which handled between 1,200 and 1,400 yards in 14 hours or two 7-hour shifts. The trucks dumped the material in windrows along the quarter points of the roadway with none in the center.

These were mixed and spread by an Adams 12-foot blade grader pulled by a Caterpillar Sixty tractor. The sequence was to blade the right hand

(Continued on page 8)

Low Bidder Produced 48-Inch 12-Foot Pipe at Temporary Plant

and 500 feet from the end of the projected pipe line. The plant, which was located between two sidings of the New York, New Haven & Hartford Railroad where a secondary highway crosses the railroad, was laid out in the shape of a Y parallel to the railroad.

Type of Pipe and Joint

The type of pipe made was what is known in the waterworks field as steel cylinder, reinforced concrete pressure pipe. The pipe consisted of a welded steel cylinder lined on the inside with concrete and covered on the outside with a heavy layer of concrete reinforced both longitudinally and circumferentially with steel bars.

The pipes were built with expansion joints consisting of steel rings welded to the steel cylinder, and so shaped that when the spigot was entered into the bell, a wedge-shaped recess was formed to receive a lead gasket which was caulked from the inside of the pipe.

Making Outside Reinforcing Cage

Coils of $\frac{1}{2}$ -inch diameter "hot rod" were delivered from the railroad at the extreme end of one branch of the production plant. The coils were placed on spools and one end fed into a spiraling machine, which first straightened the coiled rod, then curved it to the proper radius and finally spiraled it at uniform spacing about a collapsible winding mandrel. The end of one coil was welded to the end of the next coil in an electric butt welder, and the weld tested before it passed into the machine. The spirals were spaced on 2.4-inch centers and tied with 12-gage wire to eight longitudinals of $\frac{1}{2}$ -inch diameter rod. These longitudinals were initially held by clamps and only part of the ties made before removing the collapsible mandrel to permit another cage to be wound while other workmen completed the tying.

The finished cages were rolled to the

(Continued on page 18)



Excavation and Hand Backfill Within Two Pipe Lengths

Casting and Driving 75,450 Feet of Piles

(Photo on page 40)

FACTORY production with factory results in the strength of field-produced concrete which made it possible to drive piles eleven days after casting is the record of Keliher Construction Co., of Dallas, Texas, on its contract for the construction of the 6-pile bent and concrete deck highway bridge through the floodway area of the Bonnet Carré Spillway 30 miles north of New Orleans on the Airline Highway to Baton Rouge and northern Louisiana. Consistent production and care in the preparation of the equipment made it possible to drive from fourteen to eighteen of these piles daily.

The piles varied in length from 90 feet to 75 feet and the 75,450 feet of piles used for the pile bents were distributed in length as follows:

90-foot piles.....	228
85-foot piles.....	60
80-foot piles.....	246
75-foot piles.....	402
Total piles.....	936

The piles were uniformly 20 inches square with 1½-inch chamfers at each corner. The driving heads were 15 inches square and 10 inches high and not included in the nominal length of the pile. The tips were tapered for 5 feet from the end down to an 8-inch square tip.

The Casting Yard

The casting yard consisted of the section at one end where the reinforcing was made up according to the specifications for each pile by a group of nine men. The reinforcing consisted of 1¼-inch square deformed bars 2½ inches from the face of the pile, set one at each corner and on two opposite sides two other rods of the same size. On the two other sides the reinforcing was confined to the middle third of the pile and the bars were 1-inch square and placed at the middle of the side. This reinforcement plus the spiral reinforcement of ¼-inch round wire with a 6-inch pitch was for piles longer than 75 feet. For the group from 40 to 75 feet in length the reinforcing was generally similar except that there were three rods on a side instead of four. A power device was used to prepare the spiral on the job by winding around four pins from a reel.

There were five bays in the casting yard, in three of which it was possible to cast 30 piles at a time and two bays with a capacity of 24 and 29 piles. It redounds to the credit of the contractor and the superintendence that the piles were cast and cured with such thoroughness that they passed the tests at all times and were driven regularly 11 days after casting. The casting floor was of 2 x 6-inch wood laid on a suitable foundation to secure a level floor at all times. When the floor became worn after repeated use it was covered with

Remarkable Work Done by Keliher Constr. Co. on Highway Bridge near Bonnet Carré Spillway

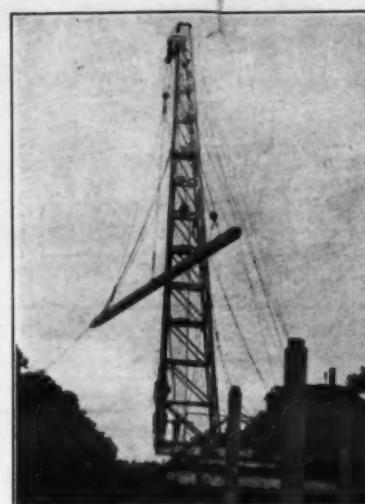
28-gage sheet metal. Chamfer strips of 2 x 2-inch material cut diagonally were nailed to the bed of the casting floor to provide the chamfer in the completed pile.

Side Forms Developed by Walker

The side forms for the piles were developed by Gordon Walker of the Keliher Construction Co. and were one of the features of the casting method which permitted rapid setting and collapsing of the forms. It is understood that a patent, covering the features of the forms, has been applied for. They were built the length to permit casting the longest piles and of 10-gage metal bent in at the top to form the upper chamfer. The sheets were built up in pairs suitably spaced with spot-welded plates which also acted as guides for the handles and rods which tripped the spacer hinge near the bottom and permitted the form to collapse and be removed readily. There were several of these spacer hinges for the length of each form.

The Concreting Plant

A spur track from the L & A Rail-



C. & E. M. Photo
Swinging an 80-Foot Concrete Pile into the Leads of the Pile Driver

road was used to bring in the sand and gravel for the concrete and also the cement. The aggregates came from the Flint Sand & Gravel Co., at Roseland, La., in gondola cars from which it was removed by a Lorain crane with a 60-foot boom and a ½-yard clamshell bucket to the bins of the Blaw-Knox weighing batching plant. The cement was taken direct from the freight car by hand truck and the sacks emptied into the skip car of the plant which was raised and dumped into the hopper of the Ransome 2-yard mixer at the same time the aggregates and water were delivered by the batchers. Although the specifications required a shorter mixing time the contractor chose to mix the

(Continued on page 23)

Five Miles of Welds for 2,327-Foot Pier

(Photo on page 40)

ARC welding operators, hanging in bosuns' chairs, most of the time uncomfortably close to 20-foot seas, made over 5 miles of welded joints in erecting the steel framework of a new 2,327-foot ocean pier recently completed on the unprotected sea coast at Davenport, Calif.

This ½-mile long pier, which required over a year to build, was constructed for the Santa Cruz Portland Cement Co. by Merritt-Chapman & Scott, San Francisco, California, as contractor, under the direction of R. C. Helen, Superintendent, as part of its plan to transport bulk cement from its plant at Davenport, California, where there is no harbor, to various points along the west coast. The pier carries two 12-inch pipe lines for cement, one 6-inch oil line and one 3-inch water line.

In order to provide the maximum strength to withstand the constant battering of the waves all connections for

Operators Dodged Waves While Erecting Steel for California Pier

the structure were made by arc welding.

To meet engineering as well as shipping requirements in building the pier, it was necessary to make a survey of the ocean bottom for the entire length of the proposed structure. This survey, made in September 1933, required taking soundings, shale elevations and sand depth. The bottom was found to be shale the full length of the project, with sand depths varying between 6 inches and 6 feet. A careful check was made to be sure the extending pier would be headed directly into the seas.

H-Column Piles Used

From the results of the survey it was decided to use H-column piles and to drive them to refusal with as much penetration as possible. The friction and bond value of the shale was determined by test.

A combination steel cylinder and H-beam pile trestle, well-braced and carrying a timber deck, was designed. The procedure adopted for construction consisted of completing each bent and span of the pier before starting the next. All connections were arc welded, there being over 5 miles, 26,790 linear feet, of welding in the entire structure. More than 22,000 pounds of electrode were used.

The first 840 feet of pier consists of 56 bents on 15-foot centers, each bent having three 33-pound H-column piles. The two outside piles are battered 12 on 1. Each bent is cross-braced with every other bent sway-braced by 4 x 4 x ¾-inch angles. The three piles are tied together with a sash brace. A longitudinal brace of 4 x 4 x ¾-inch angles carries through on each outside pile of



C. & E. M. Photo
Close-Up of Casting Yard, Showing Reinforcing and Forms

Maintenance Costs of New Jersey Roads

Since 1921, the New Jersey State Highway Department has kept complete records of the cost of maintenance of the highways within its jurisdiction. The records divide the maintenance into ordinary maintenance which includes work on the surface-traveled widths, work on paved shoulders, work on unpaved shoulders, drains, and ditches, and work on guard rails and fences; and extraordinary repairs which include resurfacing, rebuilding, heavy patching of the main pavement, rebuilding of paved shoulders, rebuilding unpaved shoulders and drains, new ditching, and the replacing of guard rails and fences.

The maintenance cost of each of these items includes the cost of all labor and material, a proportional part of the cost of all equipment and tools and a proportional part of the salaries and office expenses of the Maintenance Department. They do not include the cost of cleaning, snow removal, lighting, bridge maintenance and operation, and other similar items, as these costs are kept separately.

The greater part of the New Jersey state highways are paved with reinforced concrete. Other types of pavement in the state are considerably more limited and the records for them show the trend rather than the true average costs of maintenance.

Average Annual Cost of Maintenance of New Jersey Pavements per 100 Square Yards

Type of Pavement	Length Miles	Square Yards	Average Cost Per Day	Vehicles
Reinl. concrete.....	736.1	10,548,300	4,700	\$ 6.7
Sheet asphalt, conc. base.....	25.8	459,000	4,600	1.3
Bit. concretes, conc. base.....	75.1	1,273,800	7,000	2.0
Plain concrete (before 1923).....	122.8	1,438,600	2,800	2.0
Sheet asphalt, macadam base.....	37.9	459,600	2,900	3.0
Bit. penetration macadam.....	12.6	218,700	2,700	3.0
Gravel.....	57.1	536,100	1,000	6.0
Bituminous conc. macadam base.....	67.9	894,300	6,400	8.0
Macadam.....	14.8	170,600	3,000	13.0

The average annual cost of maintenance of unimproved shoulders, ditches and drains has been fairly uniform from year to year, and has amounted to \$8.00 per 100 square yards of shoulder.

The average annual cost of maintenance of guard rail has increased rather uniformly with the age of the guard rail. The average annual cost has been \$1.19 per 100 linear feet for rail built in 1931 and \$6.61 per 100 linear feet for rail built in 1921.

This material is from an unpublished report of the New Jersey State Highway Department made available by the Highway Research Board of the National Research Council.

the bent. The piles are tied together longitudinally by a truss 4 feet deep. All braces are electrically-welded and the bents are capped with 12 x 12-inch x 16-foot timbers.

Completion of the 840 feet from the abutment brought the pier to the breaker line where the water had a depth of 14 feet at mean lower low tide. Since the breaker line is the point of greatest wave force, heavier construction was used through the breaker line and for the remaining 80 bents of pier which were spaced on 18-foot centers.

A 36-foot square pier head was constructed at the sea end of the pier. This was supported by four 7-foot diameter cylinders anchored into the shale by six H-piles driven in each and filled with concrete. The cylinders were placed 36 feet apart to form the square and were tied together with structural steel, all welded.

Construction Procedure

The procedure followed in erecting the 136 bents required a temporary guide frame to hold the cylinder piles in place and, at the same time, provide a working platform while driving the piles. This frame was held at an elevation

(Continued on page 10)



NEW YORK: Texaco Asphalt approach to Hudson River Bridge at Troy, N. Y.

RHODE ISLAND: Durable, non-skid Texaco surface on Ocean Road, R. I.

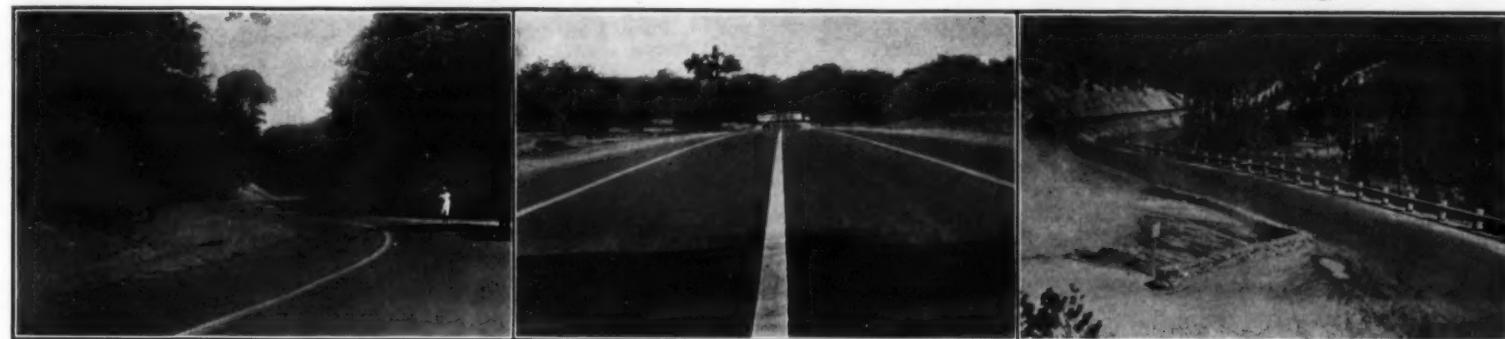
FLORIDA: Texaco-paved Biscayne Boulevard in Miami, Fla.

A Good Roads movement which has spread to every State east of the Rockies

MICHIGAN: One of the Texaco Asphalt highways serving this State.

TEXAS: Smooth, durable Texaco on Garland Road, Dallas County, Texas.

YELLOWSTONE: Part of a 28-mile Texaco road in Yellowstone National Park, Wyoming.



The movement had its beginning approximately 30 years ago. A few scattered roads and streets in the East and South constituted the nucleus.

Those original few thousand square yards multiplied steadily into millions. The movement spread across the country from Canada to Mexico, from the Atlantic to the Rockies. It embraces today every State east of the Rocky Mountain barrier.

That is the story of the development of street and road surfacing with TEXACO Asphaltic products. A few thousand square yards 30 years ago. Millions of square yards today. Not only in every State east of the Rockies, but on every one of the six continents.

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Prospects Are Good

In the preliminary report released by Administrator Ickes of PWA last month, almost 60,000 public works projects which can be undertaken as part of the new public works program are bulletined. These projects total \$8,500,000,000 and are distributed throughout the 48 states.

In order of the number of projects of each type, the survey shows 16,033 street and highway projects, estimated to cost \$1,822,563,835; school buildings, 13,048 to cost \$638,662,524; other buildings, 6,423 to cost \$639,447,400; recreational projects, 4,307 to cost \$199,380,722; sewer projects, 4,182 to cost \$675,484,487; water works projects, 3,698 to cost \$595,044,788; flood control and irrigation projects, 2,629 to cost \$1,186,466,210; grade crossings, 2,296, to cost \$333,756,593; heavy engineering structures, 1,862, to cost \$1,803,888,743; gas, electric and hydro projects, 1,115, to cost \$326,810,136; airports and landing fields, 456, to cost \$29,489,119; and miscellaneous projects, 2,837, to cost \$404,655,490.

These projects represent work which should be done, work of immediate need, and not merely work which might be done now in anticipation of some nebulous future need. This work would mean hundreds of thousands of hours of employment, direct and indirect, and represents the need for the services of a multitude of types of construction equipment and machines needed to manufacture the equipment. Funds expended on these projects over a period of two or three years will be the final lift to recovery and provide this nation with lasting works for its safety, health, and enjoyment.

Too Much Power from Grand Coulee?

There have been numerous critical editorials and letters in the press during the last few months calling attention to the fact that the ultimate power to be developed at Grand Coulee near Spokane, Wash., cannot conceivably be absorbed within the economic radius of distribution. This led to the statement that Grand Coulee had already fulfilled its function of absorbing the unemployed in the Pacific northwest and that it might as well be junked as far as its service as a power project is concerned.

To offset partially this destructive criticism a college professor, Dean A. E. Drucker of Washington State College, has submitted a report to the Columbia Basin Commission showing that the Pacific northwest already holds a pros-

pective demand for more power than the low dam at Grand Coulee can produce, and more than half of what the high dam could produce. Among the raw materials available for electrical processing in Washington, Idaho, Oregon and Montana are magnesite ore, washed high-alumina clays, phosphate rock, lime, manganese ore, iron, silica, chromite ore, zinc ore and concentrates, sand, sawdust, copper ore and concentrate, lead, anthracite coal, calcium carbide, nitrogen, quartz, tungsten, coke and sulphur. This list seems to hold some hope for an economic justification of the tremendous expenditure being made by the Federal Government in Grand Coulee.

The Ex-Grade Crossing

"The only safe grade crossing is an ex-grade crossing," said E. W. James, Chief, Division of Highway Transport, U. S. Bureau of Public Roads in his paper on grade crossing elimination presented at the recent A.R.B.A. Convention. There seems to be no physical way to make a grade crossing really safe as long as reckless drivers, careless drivers and drunken drivers will ignore automatic signals, will collide with closed crossing gates or crash into the side of freight trains on dark nights. Grade crossing accidents will continue. All we have to do is change "freight trains" to "heavy-duty trucks" and the same statement applies to highway-with-highway grade crossings.

As Mr. James points out, we cannot conceivably undertake a wholesale and indiscriminate elimination of all of our 240,000 grade crossings of all kinds immediately. We must give serious consideration, however, to eliminating those which are most dangerous, where traffic is heaviest and, what amounts to the same thing, those crossings where the largest number of careless and reckless drivers will inevitably pass, the grade crossing nearest the city.

Grade crossings cannot be eliminated solely on the basis of physical injuries or deaths which have occurred on the site, because some of the worst accidents have occurred at crossings of definitely minor importance which, under no reasonable program of elimination, would be abolished for many years. The economic factor to be considered is the time lost by vehicles waiting at crossings. It is unfortunately true that, in the human equation, the more chance there is that time will be lost through waiting at a crossing, the more eager the driver will be to take a chance to beat the train.

small change in stream channels, super-elevation of curves, rounding of dangerous corners, and such items, which, because of their miscellaneous nature, do not lend themselves to contracts, but are of enough importance to be dangerous to traffic if not done. This class of work is a transition between strict maintenance and unquestioned construction work.

From a paper presented by C. W. McClain, Engineer of Maintenance, Indiana State Highway Commission, before the Purdue Road School.

Highway Maintenance Through Improvement

It is sometimes difficult to distinguish between maintenance and more or less permanent changes which fall in the class of minor improvements. Under this heading come culvert and small structure extensions, installation of French drains and perforated pipe,

Protests Charge for Plans

To the Editor
Contractors and Engineers Monthly

The writer, a structural engineer, who practiced engineering in Illinois for a number of years but now is in the contracting business, notes with apprehension the recently developed practice of engineers in making a charge to contractors for plans and specifications. They even go so far that in two recent cases we have been refused bidding sheets because we did not pay the specified fee and because the bidding sheets were included as a part of the specification, therefore, we were unable to bid on the proposed work.

On a single project the payment of a fee is a negligible item but under present circumstances where we are called upon to bid on a large number of projects, this matter becomes rather serious.

The writer has prepared the following editorial for the Bulletin of the Illinois Society of Engineers, of which he is a member.

"In looking over the advertisements for bids on various public works projects, we notice a growing tendency to require contractors to pay for plans and specifications; in fact, nearly every recent project has required the payment of from \$5 to \$25. This practice appears to have evolved from that of requiring contractors to make a cash deposit to insure the return of plans taken out for bidding purposes.

"We have always understood that it is the duty of the owners to furnish plans and specifications so that contractors' bids will be on a uniform basis and in the past the fees paid to the engineers in most cases were to include the cost of preparing drawings, specifications and bidding sheets.

"The charges made by the Illinois Highway Department are small by comparison but can be justified because a quantity survey is furnished with the plans and in no case is a charge made for specifications and bidding sheets.

"A contractor must go to a considerable expense to prepare an estimate of cost and make a bid on a particular project, probably much more expense than some engineers realize. It seems unfair to require him to make a cash outlay for plans, which, unless the contractor is awarded the job, were prepared solely for the owner.

"This practice appears to us to be in the nature of a 'petty racket' and beneath the dignity of a profession which we have been striving for years to get the public to appreciate.

"We know of no instance where architects on public or private work have required contractors to pay for plans and we believe that this practice among engineers should be discouraged."

If you think this matter merits consideration, we would like to hear what other contractors and engineers think about it.

March 18, 1935 CONTRACTOR.
Downers Grove, Ill.

Engineer Joins Protest

To the Editor
Contractors and Engineers Monthly

I am altogether opposed to the practice of charging contractors for the plans and specifications prepared for the receipt of bids.

To protect the engineer from demands of other than bona fide bidders, a deposit to be rebated on receipt of proposals or return of plans and specifications is well justified, but any practice which involves petty rackets from contractors is, in my opinion, contrary to the best interest of the engineer and to the authority letting the work.

Frank A. Barbour,
CONSULTING ENGINEER.
March 21, 1935
Boston, Mass.



TOOLS LIKE THESE
SHOULD GO TO THE
REPAIR SHOP OR
JUNK PILE - THEY
ARE DANGEROUS

NATIONAL SAFETY COUNCIL

Safety Suggestions for Road Construction

These suggestions, offered by a Superintendent of Road Construction, come to us by way of the Construction Safety News Letter. We are glad to pass them on in a slightly abbreviated form to you, in the hope that they will help to make your job safe.

1. Provide leather gauntlet gloves for men who handle forms. Men working with joint filler should be furnished with asbestos gloves.

2. Mushroomed heads of sledges, hammers, form pins and other tools should be promptly removed after use.

3. Nails and spikes in used lumber should be pulled or turned down.

4. Men should be properly instructed in how to handle blocking when loading and unloading equipment. Two men should handle material so that it is not necessary for a man to place his arm or body under equipment.

5. Guards should be maintained on paver skips.

6. Gasoline motors should be stopped when being filled with gasoline, or when adjustments and repairs are being made.

7. Defective or ragged cables should be promptly replaced.

8. Fires should not be built along the roadside.

9. Men unloading and handling mesh should be instructed to be watchful so as to avoid bumping their legs against the ends of the steel. When moving with the steel toward the puddlers, they should shout "Gangway—Steel", to avoid striking others with it.

10. Select men whose sight, hearing and attitude indicate an active mind.

11. Do not operate trucks in heavy fog or dense dust. Dusty spots on the road should be treated with calcium chloride.

12. Instruct bulk cement handlers to shovel in such a manner that the cement dust won't get in their eyes. Require the floor to be kept clean as they work along, so they won't have to wade through cement dust.

13. Keep stockpiles in neat order at all times. Trucks should be parked in straight lines. Rollers, patrols and tractors should be parked in an orderly manner.

14. Keep the Job Office clean.

15. Truck drivers should be provided with a cleaning cloth, to remove surplus grease and dust from motors and cabs.

16. Goggles should be provided and their use required in welding and grinding operations, and for other operators where their use seems advisable.

17. In case of accident: personally interview the injured employee and his foreman. Administer first aid at once and send for a doctor. Then make a detailed report of just how the accident happened, and the recommendations of employee and foreman on the steps to be taken to prevent the recurrence of a similar accident.

An Effective Code for Road Builders

Keep Code Out of Court, Power Over Awards Most Effective Control

By F. A. CANNON
Executive Secretary
Highway Industrial Code Authority
Milwaukee, Wis.

WISCONSIN is the only state operating under a state highway industry code. The Wisconsin Recovery Act was passed by the Legislature of 1933, empowering the formulation of codes to be approved by the Governor of the State. The Highway Industry Code was promulgated under the terms of this Act and became operative August 23, 1933.

The code is administered by a Highway Industry Code Authority, consisting of eleven contractors selected by contractors, a consumer representative appointed by the State Code Administrator and a labor representative, also appointed by the State Code Administrator. The Wisconsin Recovery Act is based along the general lines of the National Recovery Act but is much more rigid. Under its terms anyone violating the code is subject to a fine up to \$5,000, or imprisonment for one year, or both. A person violating the code to which he is subject may be haled into a court of equity and restrained from continuing in violation. The State has twenty codes, practically all of which are operating effectively.

The Code Estimate Sheet

The heart of the Highway Industry Code is the official Code Estimate Sheet, on which each item of cost is entered. Every contractor bidding is required to enter each item of cost, direct and indirect. These sheets are enclosed with the bid proposal sent out by the Highway Commission. The contractor fills them in when he makes out his bid blanks, puts them in an envelope and returns the estimate sheet to the Highway Commission with his bid.

Immediately after the letting the estimate sheets are turned over to the Highway Industry Code Authority. If a complaint is made, or if it appears that the code has been violated by bidding below cost, these sheets are opened and checked. If, after checking the estimate sheets, it still appears that there has been non-compliance with the code, the contractor is summoned to appear before the Code Authority and given a hearing. If he explains the estimate sheet satisfactorily there are no further proceedings. If he does not, the findings of the Code Authority are then cited to the State Code Administrator, an officer appointed by the Governor to

assist him in enforcing the terms of the code. The contractor is given a hearing by the Code Administrator, where the State Code Authority is also represented. If it still appears that the code has been violated by the contractor, the facts are cited to the Wisconsin Highway Commission with the request that the Commission refuse to award the contract to the contractor in question.

Practically every contractor has made a practice of price cutting by omitting items as well as by below-cost bidding

(Continued on page 24)

Stabilization Methods for Low-Cost Surfaces for Traffic-Bound Roads

Important changes in construction procedure for the stabilization of traffic-bound roads are incorporated in a new bulletin entitled "Typical Specifications for Low Cost Wearing Courses for Roads Stabilized with Calcium Chloride and Binder Soil" now available from

the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich. The use of calcium chloride as an admixture in the surface mixing operations and increasing the limits of proportions of

coarse aggregates are recommended and discussed.

Copies of this Bulletin No. 20 may be secured free by those interested from the Association.

JAEGER "SURE PRIME" PUMPS

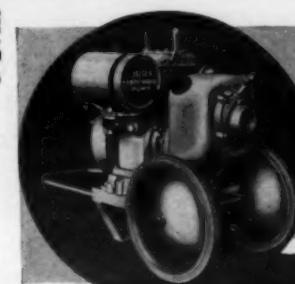
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Portable Pump

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\$10 Extra for Rubber Tires

bays this
8500 Gal.
"Handy Model"



THE JAEGER MACHINE CO.
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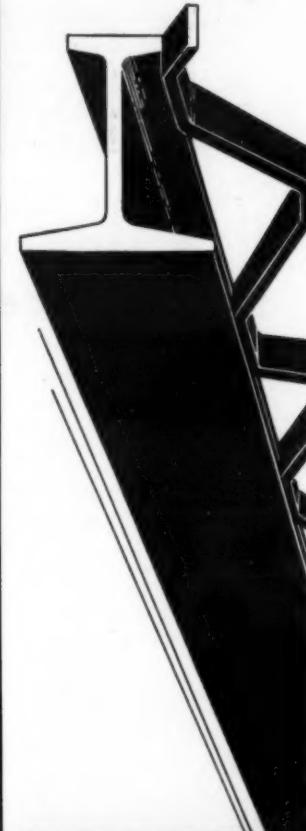
These Practical Advantages Are Your Best Assurance of Strength and Permanence.

- Combines great strength with lightweight. Comparing weight with carrying capacity, is lightest and strongest bridge floor on the market.
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- Cross bar reinforcing in bottom of the slab assures adequate lateral distribution of stresses.
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NATIONAL CARBIDE SALES CORP. NEW YORK
LINCOLN BLDG. (Opp. Grand Central)

Are You Losing Profits Through Lost Time?

THE time and the amount of rolling of bituminous surfaces very decidedly affect the speed with which a job is done, which in turn determines whether or not there are to be any profits. The following data, reported by C. F. Rogers, Assistant Highway Engineer, U. S. Bureau of Public Roads, will help you to end the job on the black side of the ledger.

Exact Determination of Rolling Requirements

The purposes of rolling are to reduce the voids in the pavement and thereby increase the density and stability and also to produce surface smoothness necessary for riding comfort. In the western states the initial compaction is generally done by longitudinal rolling with three-wheel (macadam-type) rollers weighing from 10 to 14 tons and of the gas-engine type. This is followed by longitudinal, transverse, and diagonal rolling with tandem rollers weighing from 6 to 8 tons. Details of typical rollers are shown in Table 7.

Table 7.—Dimensions and Weights of Typical Rollers

Type	Wt.	Wheel Weight		Wheel Width		Lbs. per in. of wheel width	
		Front	Rear	Front	Rear	Front	Rear
3-wheel...	Tons	Lbs.	Lbs.	Ins.	Ins.	Ins.	Ins.
Do	12.1	6,530	17,620	40.8	40.8	150	430
Do	11.1	6,280	15,880	40.2	43.2	156	367
Tandem...	8.6	5,140	12,110	50.4	50.4	102	240
Do	8.5	5,170	11,900	50.4	50.4	103	236

As a basis of comparison of amount of rolling on base and surface courses on different projects a "rolling factor" has been derived. This is the product of wheel widths and distance traversed on a given section of pavement divided by the area of the section. Roughly, this factor represents the number of times each unit of area is traversed by a roller wheel. Table 8 shows the successive steps in rolling on two projects.

Table 8.—Comparison of Amount of Rolling on Two Projects

Job	Course	Roller type	Wt.	Operation	Rolling factor
A	Base	3-wheel...	11.1	Initial	5.2
		Tandem...	8.5	Final	5.8
	Total...				11.0
	Surface...	3-wheel...	12.1	Initial	12.4
B		Do	11.1	Longitudinal	3.5
		Tandem...	8.5	Diagonal	6.0
		3-wheel...	11.1	Longitudinal	3.1
		Tandem...	8.6	Transverse...	3.8
B	Total...				28.8
	Base	3-wheel...	12.0	Initial	3.76
		Tandem...	9.2	Final	2.80
	Total...				6.56
B	Surface...	3-wheel...	12.0	Initial	7.33
		Tandem...	9.0	Longitudinal	4.12
		Do	9.2	Diagonal and transverse...	4.28
	Total...				15.73

On job A both the base and the surface course were given nearly twice the amount of rolling as on job B. Assuming a plant production which would require four rollers with the rolling factor of job B, substitution of the rolling factor of job A would make three additional rollers necessary. These and other observations lead to the conclusion that either some surfaces are insufficiently compacted or there is a waste of more rolling than is necessary on other surfaces. There is need for a more exact determination of rolling requirements.

Rolling After Pavement Has Cooled
Ineffective
Time studies reveal that the average

Part VI of Studies of the Construction of Mixed Bituminous Roads

roller operates but 70 per cent of working time with nonproductive delays as follows:

	Per Cent
Waiting for material	6
Operator idle	6
Take on fuel	11
Mechanical	6
Miscellaneous	1
Total	30

Wide ranges in roller speed were observed. Speeds of 1.2 to 1.4 miles per hour or 110 to 125 feet per minute appear (Continued on page 13)



NON-CLOGGING NON-RESTRICTIVE AIR-MAZE AIR FILTERS FOR EVERY INDUSTRIAL PURPOSE

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SPECIFY AIR-MAZE when ordering new equipment and get those important "plus" features that are only to be had with the genuine Air-Maze.

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—official A. A. A. record made March 2 at Daytona Beach, Florida, by "Wild Bill" Cummings with 6-cylinder Model "HA" CUMMINS Diesel Engine.



CUMMINS DIESEL ENGINES

—Ideal for Stationary and Portable Power Applications as well as Automotive service

—but more impressive than speed records are CUMMINS performance records in Trucks

PURITY STORES LTD., San Francisco, California, have the distinction of being the first user of CUMMINS Diesel Engines in commercial truck operation. Started with one CUMMINS Diesel in 1932; now has 12 CUMMINS-powered trucks in service, with a total of more than 1,000,000 miles of operation. The first engine has passed the 225,000 mile mark. This company reports a fuel saving of 82.4% over gasoline engines in same service. Says: "Cylinder wall wear about one half the rate of gasoline engines. Valve grinding has not been necessary half as frequently."

PACIFIC FREIGHT LINES, Los Angeles, California, started with 2 CUMMINS Diesels in trucks—now operates a total of 73 CUMMINS-powered trucks, 7 of which have run over 175,000 miles, 12 over 150,000 miles, 18 over 100,000 miles. Reports a fuel saving of 5 1/4c per truck mile over gasoline-powered equipment.

CONSOLIDATED FREIGHT LINES, Portland, Oregon, installed their first CUMMINS Diesel in June, 1933. Now operate a total of 37 CUMMINS-powered trucks, 12 of which have run more than 100,000 miles. Total mileage of entire CUMMINS-powered fleet is in excess of 2,500,000 miles.

TRANSAMERICAN FREIGHT LINES, INC., Detroit, Michigan, have used CUMMINS Diesels more than 800,000 miles in their truck fleet. Report a fuel saving of approximately 80% over gasoline-powered trucks.

In August, 1931—A 17,000 pound truck, powered by a 4-cylinder CUMMINS Diesel, traveled from New York to Los Angeles—3,214 miles—in less than 98 hours running time. Total cost of fuel, \$11.22 (average cost, 5 1/2c per gallon). Average miles per gallon, 15 1/4.

In December, 1931, a 16,750 pound truck, powered by a 6-cylinder "HA" CUMMINS Diesel, made a 14,600 mile Non-Stop Run at Indianapolis Motor Speedway—14 days and nights. Average speed: 43 miles per hour. Average fuel cost per mile, less than 1/2 cent.

NOW OVER 3,000,000 MILES A MONTH IN HEAVY-DUTY TRUCKS

The use of CUMMINS Diesel Engines by progressive truck operators has increased so rapidly during the past three years that today the total mileage of all CUMMINS-powered trucks in the U. S. exceeds 3,000,000 miles a month.

The examples given on this page are of only a few of the hundreds of truck operators who now use CUMMINS Diesels to get superior power performance and amazing economy of operation.

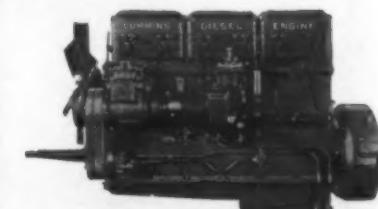
The range of CUMMINS Diesel applications covers every class of heavy-duty truck operation—from the single truck user up to large fleets—and every type of truck, load, road and climate. See your nearest CUMMINS dealer for complete facts.

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for Lowest-Cost Trucking



The improved CUMMINS Diesel—6 cylinder, 125 H. P.—embodies many important new advantages. Write for descriptive bulletin.

(Advertisement)

Hydraulic Controls for Earth Moving Equipment

By E. C. BROWN
Austin-Western Asst. Chief Engr.

The growing recognition of hydraulic control throughout industry has led to wide interest in its use for earth moving equipment. Its fundamentals are as simple as the lifting mechanism on a barber chair or hydraulic jack.

A statement of the basic principle would be: A means of applying force to fluid in a confined space so that it is transmitted and exerted at some other desired point. Since practically all the necessary controls of road machinery have been accomplished mechanically by shafts, universal joints, chains, cables, etc., hydraulic control does not come into the field to accomplish what is impossible by mechanical means, but to do the same things better.

In certain applications this control offers better results because of greater flexibility, virtual elimination of moving parts and therefore greater durability. Its development in the form of a power control makes the method particularly suitable to earth moving equipment. In practical use on Austin-Western Machines oil under pump pressure is the hydraulic force exerted at remote parts as desired by the operator in the cab. A small rotary hydraulic pump forces oil into the system or line, and the machine operator has hydraulic power at his disposal. Convenient to his hand are valve levers which direct the flow of oil into the cylinder which raises or lowers a blade, leans front wheels, lifts a plow, or whatever the particular function may be.



The Austin-Western Roll-A-Plane with Hydraulic steer and center roller control.

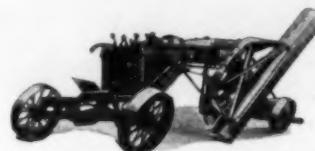
The pump draws oil out of the reserve oil tank by creating a vacuum in the line. It receives the oil and pumps it into the discharge line. Unlike steam or air, oil is practically non-compressible and as more oil is crowded into the discharge line something has to move. The oil passing through the control valve reaches the ram cylinder and as more oil is pumped into the line the piston of the cylinder moves out to make room for the additional oil which is flowing from the pump.

It should be kept clearly in mind that the entire hydraulic system of pipe lines, hose, valves, and ram cylinders is completely filled with oil at all times. When the control valve diverts the oil into one end of the ram cylinder the same valve automatically opens the other end of the cylinder. As the piston advances the oil at the opposite end of the cylinder is forced out and returned through the control valve to the storage tank.

When the operator closes the control valve (puts it in neutral) he automatically stops the flow of oil to or from the cylinder and since there is a solid mass of oil in each side of the piston, piston and rod are rigidly locked in position. If it is necessary to send the plunger to the end of the stroke to reach the

(Advertisement)

desired position the oil pressure does not continue to build up indefinitely but a relief valve set in the discharge line permits the oil to escape to the storage tank when pressure has reached its predetermined maximum.



Blade Grader with hydraulic blade lift; reverse and side shift; wheel leaning; frame shift on rear axle; and steer.

This escape valve is only called into play when the plunger is at either end of the stroke and the valve has not yet been set at the closed or neutral position. When the valve is closed, locking the position of the piston, the control valve simultaneously opens to carry the

(Advertisement)

oil through the manifold and back to the reserve tank.

The system is a free circulating system wherein the pump is called upon to work under pressure only when a movement of one of the pistons is desired.

The first experiments with hydraulic controls for earth moving equipment were undertaken by the Austin-Western Road Machinery Company in 1931. They were sold as standard equipment



77 Dual (4 wheel Drive) Motor Grader available with hydraulic control of leaning wheels, blade lift, steer, circle reverse and side shift.

(Advertisement)

for the 77 Motor Grader in 1932 because it was found that in addition to its speed in controlling the operation of the machine the simple mechanism eliminated most of the handicaps of mechanical operation.

There are no gears or universal joints to wear down and cause faulty control. Both the rotary pump and the cylinder plunger operate constantly in oil reducing wear and power loss to a minimum.

The successful operation of the hydraulic controls on the motor grader in operation by contractor and public officials has led to its use in Austin-Western Blade Graders, Rollers, Dump Wagons, Bulldozers, Elevating Graders, Motor Sweepers, etc., wherever fast accurate control is a factor in operating efficiency.

For further information in operating efficiency of hydraulic controls and their money-saving value write to The Austin-Western Road Machinery Company at Aurora, Illinois.

To get **THIS BITE**

The "bite" of the blade, as it smoothly rolls the earth along its carefully calculated curve, tells the whole story—tells the difference between an Austin-Western Grader and another.

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Miss. Experiments on Sand-Clay Base

(Continued from page 1)

windrow to the right edge, the left windrow to the left edge and then both windrows from the edges to the center of the road. The material was then spread with the grader with a special device attached to the moldboard of the blade. This consisted of a 12-foot 5 x 5-inch angle with slots burned in the upright leg for attaching to the moldboard. Along the horizontal leg 18-inch lengths of 3 x 2-inch angles were attached to the 5-inch leg with the 3-inch side of the smaller angles turned down. These mixing blades were riveted at an angle of about 30 degrees with the center line of the roadway and about 1 foot apart, all throwing material from the edge toward the center. The lower edge of each mixing blade was protected by a piece of grader blade bolted to it to reduce the wear.

In this manner a base course of well-mixed sand clay was built up in thicknesses varying from 6 to 15 inches. Where clay predominated in the foundation the base course was made thicker. This course was under continuous maintenance and opened to traffic for 30 days to compact it. When the grade was too dry to compact well, a water wagon was run over it to wet it down. In order to force traffic to the edges to compact them as well as the more heavily-traveled center section, blocks were set along the center to act as barriers that could be readily moved about.

Priming the Base

As soon as the base was sufficiently firm it was swept by an Austin rotary broom to eliminate the floating surface material. Then a prime coat of Koppers 15-viscosity tar was applied. This was delivered in tank cars at Tawanta, Miss., a dead haul of about a mile from the middle of the job, and applied by the contractor's own Model F3 Etnyre 600-gallon distributor mounted on a White truck. The tar was applied at the rate of 0.3-gallon per square yard for the full 22-foot width of the base.

The primed base was allowed to cure for three days and then opened to traffic for three days to anneal it. The prime was found to penetrate about $\frac{1}{2}$ to 1 inch into the base material.

Applying the Surface Coat

After the prime had been cured under traffic, the traffic was removed and the prime swept with the power broom. Very few repairs to the prime were necessary and these were made by using either tar or emulsion and fine aggregate.

Upon the cleaned primed base was then placed 0.5 cubic foot per square yard of $\frac{3}{4}$ -inch gravel containing 55 per cent by weight of crushed particles, obtained from a pit of the American Sand & Gravel Co., in Hattiesburg, Miss., and delivered by Southern Rail-

WONT QUIT or cause time out



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company
32-36 Dey Street
New York, N.Y.

Hayward Buckets



C. & E. M. Photo
Surface Maintenance Just Before Traffic Was Turned Onto the Road

road in gondola cars to two unloading points. About one-half was delivered to Moselle and the remainder to Tonneys. It was unloaded by hand to metal unloading boxes attached to the sides of the cars and tipped into the trucks below. Each box held about $2\frac{1}{2}$ cubic yards of gravel. It was spread evenly over the surface by Stolle spreaders attached to the trucks as they came up to the area being covered. The boxes were about 7 feet wide and were placed

at the outer edges of the 20-foot roadway section. The middle section was covered by a second trip with one of the boxes. The material was spread about $\frac{3}{4}$ inch thick, then hand-broomed where it was a little high and finally dragged with a gang broom made of a frame measuring about 8 feet on a side with 16-inch steel brooms staggered except on the back stretch where they were solid. This was pulled with one of the

(Continued on page 17)

New Chicago Water Tunnel Holed Through Last Month

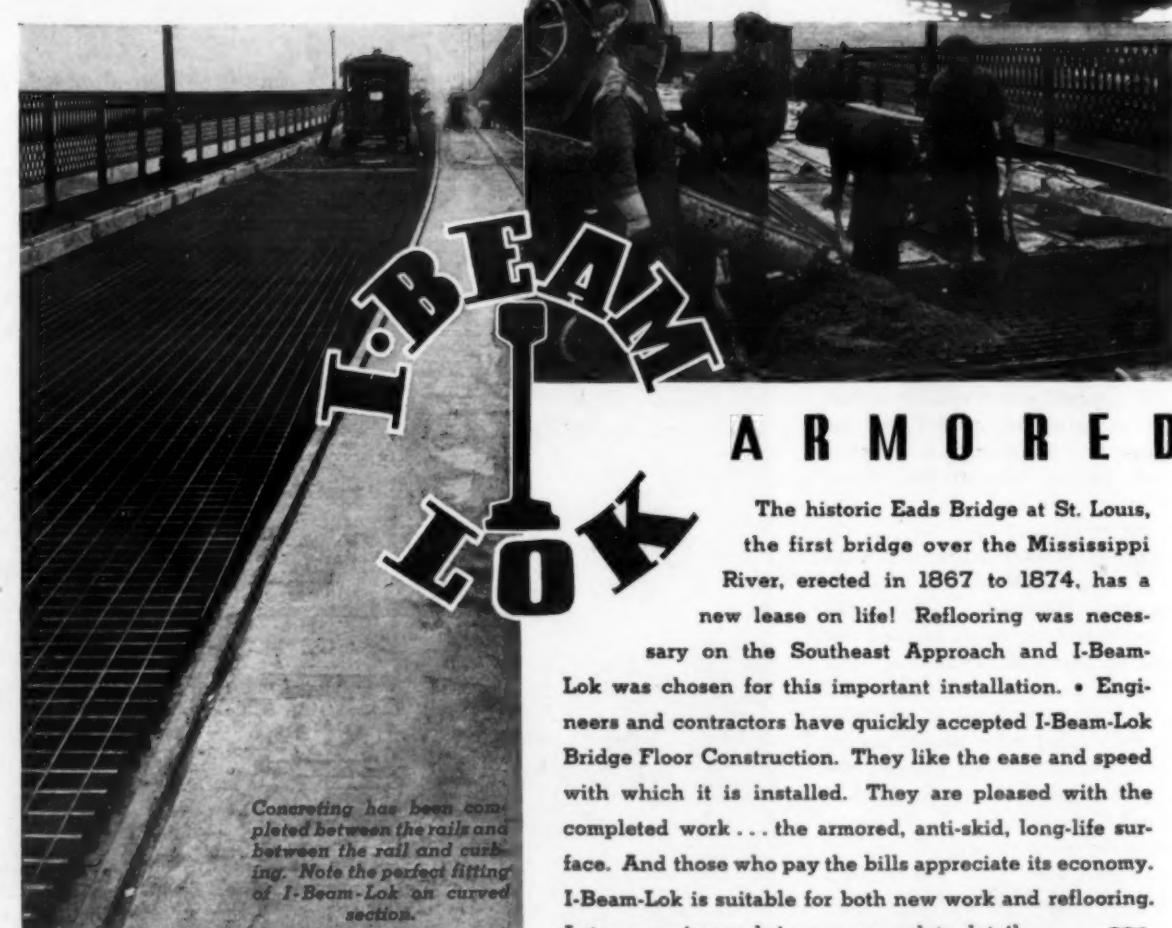
For more than a decade Chicago has been working away on its $11\frac{1}{2}$ -mile water tunnel which was holed through last month. Blasted through solid rock, it will carry water from a crib 3 miles out on Lake Michigan to the western limits of the city and has a capacity of 700,000,000 gallons a day. The project will cost \$13,000,000 when completed.

The final blast of dynamite broke through a 120-ton wall of stone, 165 feet below the ground level. Approximately 2,000,000 pounds of dynamite were used to create this bore.

Work and wages for one out of every six persons in the nation's wholesale, retail and service trades are provided by firms wholly dependent upon automotive, petroleum, tire and other sales connected with highway use, according to a statement by the National Highway Users Conference.



**Rejuvenating
a Patriarch**



**I-BEAM
LOK**

ARMORED

The historic Eads Bridge at St. Louis, the first bridge over the Mississippi River, erected in 1867 to 1874, has a new lease on life! Reflooring was necessary on the Southeast Approach and I-Beam-Lok was chosen for this important installation. • Engineers and contractors have quickly accepted I-Beam-Lok Bridge Floor Construction. They like the ease and speed with which it is installed. They are pleased with the completed work... the armored, anti-skid, long-life surface. And those who pay the bills appreciate its economy. I-Beam-Lok is suitable for both new work and reflooring. Let our engineers bring you complete details.

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FIRESTONE pioneered the ship-by-truck movement in 1918, and ever since has consistently led in anticipating every requirement in the design and construction of truck and bus tires for every transportation condition. To accomplish this, Firestone has consistently followed the fundamental principle of its founder and active head, Harvey S. Firestone, "Always to find the way to build tires better than anyone else."

While there are many reasons why Firestone Tires are safer and more economical, there are two reasons that stand out above all others. One is Gum-Dipping; and the other is two extra layers of Gum-Dipped cords under the tread.

By Gum-Dipping, every strand in every cord is soaked in liquid rubber, preventing friction — adding extra strength and long mileage. By having two extra layers of Gum-Dipped cords placed between the tread and cord body, it is practical to use a tread with higher, more rugged shoulders and a deeper non-skid with flatter contour.

All this provides more rubber on the road, giving longer wear, greater traction and quicker stops. These two extra construction features are patented and used only in Firestone Tires. Take a forward step in maintaining schedules and reducing operating costs. Call on the Firestone Service Store or Firestone Service Dealer today.



Firestone
HIGH SPEED TYPE

Greatest tire ever built
for all-round service.

Firestone
OLDFIELD TYPE

The tire that taught
thrift to millions.

Firestone
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Volume production
tire for light trucks.

Firestone

GROUND GRIP TYPE

Super traction tire for
unimproved roads.

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For quick
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longer
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FIRESTONE BRAKE BLOCKS and HEAVY DUTY LINING



For better braking
control.

FIRESTONE FAN BELTS



FIRESTONE RADIATOR HOSE



Firestone

5 Miles of Welds for Calif. Pier

(Continued from page 2)

tion of one foot below the cylinder cut-offs by cables from the last completed bent. The frame was left in place until the entire bent was finished, after which it was picked up and moved ahead for the next bent. With the frame in position, the three cylinder piles were driven and cut off to their proper elevation. The sand was removed from the piles by compressed air and the three standard 10-inch 49-pound H-column piles driven with a drop-hammer to obtain maximum penetration. So hard was the driving that the heads of the piles were battered by the blows and had to be cut off several times.

Following the driving of the piles, the lower sash brace was placed and spot-welded. The piles were then cut to grade and a temporary 12 x 12-inch x 36-foot wood cap placed on the piles for supporting the pile driver and to provide a working platform. Two 12-inch channel-iron caps were hung and the bent was ready for cross-bracing. The two brace piles were driven, brought into position and welded. The longitudinal struts were placed, the bent sway-braced and the trusses hung. The cross-braces under deck were placed and a carpenter crew laid the wood deck.

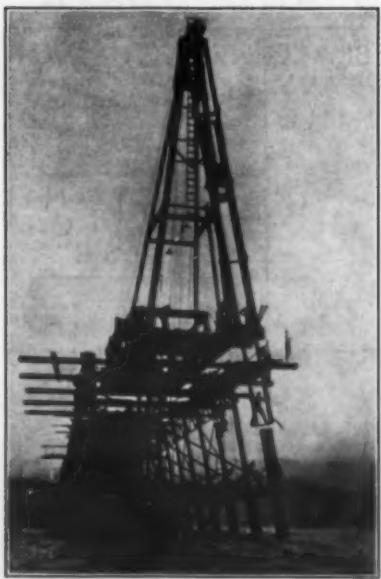
After completing the steel work on a bent, the cylinders were watered and the concrete poured. Placing the concrete was done through pipes.

Welding Under Difficulties

The welding was carried on in conjunction with the pile driving and steel erection. All braces were tacked in place and welded. As the welding on each bent was completed, the temporary framework was moved ahead and welding started on the next bent. It was necessary to complete the welding of each bent before moving ahead as any work not tied together would be knocked down by the heavy seas which came without warning. About 24 working hours were required for welding each bent of the pier.

The welding was carried on almost entirely from bosuns' chairs and work was seriously hampered by rolling seas. The welding of the bottom braces was done under particularly trying and hazardous conditions. It was often necessary to place one man to watch the seas and warn the welders and workmen to start climbing when a large wave came along. A diver followed the welders and placed the underwater clamps which hold the brace piles to the center pile of each bent.

All materials used in construction had to be handled over a 50-foot bluff



An End-On View of Bent No. 131

with a 100-foot boom stiffleg derrick and carried out on the pier on cars pushed by a small locomotive. Concrete materials were handled in skips loaded on cars and pushed out behind the concrete mixer, also mounted on a car behind the pile driver.

Underwater Cutting with Torch

Placing the cylinders for the pier head required driving falsework piling and 34 steel H-beams which were later cut off at the ground line by a diver using an oxy-electric underwater cutting torch, with current generated by a 300-ampere arc welding machine.

Personnel

The design and construction of the pier was carried out for the Santa Cruz Portland Cement Co., by the West Coast Division of Merritt-Chapman & Scott Corp., with R. C. Helen in direct charge of operations for the contractor. Parsons, Clapp, Brinkerhoff and Douglas of New York acted as consultants in working out the design. The Lincoln Elec-

tric Co., Cleveland, Ohio, was consultant for the welding operations and supplied the welding equipment.

Promotions at Link-Belt

Several promotions in the central division conveyor sales organization have recently been announced by Link-Belt Co., Chicago, Ill. William L. Hartley, heretofore Manager of the Detroit office,

has been made Manager of foundry equipment sales, with headquarters in Chicago. Harold L. Hoefman, previously Manager of the company's Indianapolis branch, succeeds Mr. Hartley as Manager of the Detroit office. Richard B. Holmes, of the St. Louis office, succeeds Mr. Hoefman as Manager of Indianapolis branch sales and Carl A. Blomquist of Chicago takes Mr. Holmes' place at St. Louis.

THIS MAY INTEREST YOU!

FLEX-PLANE machines will screed concrete and black top roads 3 to 50 feet wide. Will install contraction joints in concrete roads—both longitudinally and transversely. FLEX-PLANE retread spreaders for spreading full width road to any depth.

FLEX-PLANE has the adjustability—the utility—the serviceability.
FLEXIBLE ROAD JOINT MACHINE COMPANY

WARREN, OHIO

LeTourneau EQUIPMENT MOVES More Yardage —JOBS Prove IT



Two LeTourneau Buggies in the granite at the All-American Canal.



(Below) Five Carryalls on the Broadway Low Level Tunnel job.

25 TO 30 YARDS PER LOAD . . . A round trip of 1100 feet, including a 400-foot climb with average grade of 7%, maximum 11%, made every 12½ minutes, of which 5.1 minutes is spent in loading. That's what two LeTourneau Buggies (above), pulled by 75 H.P. Diesels, are doing in the granite at the All-American Canal. More than 125 yards per Buggy hour!

72 CUBIC YARDS PER SCRAPER HOUR . . . on a 1600-foot round trip haul, over favorable grades of 38 to 40%, but loading in tough clay and decomposed rock. That's what these five Carryall Scrapers (left) are doing on the Broadway Low Level Tunnel near Oakland, California. These jobs are typical of LeTourneau performance from Bonneville to Rhode Island.

Ask for DATA SHEET PROOF . . . Write us, describing your earthmoving problems; our Engineering Department will gladly send you Data Sheets and information telling you how LeTourneau Equipment has whipped similar problems for others.

R. G. LeTourneau, Inc.
Peoria, Illinois Stockton, California
Cable address: "Bobletorno"

LETOURNEAU

A Crankless Diesel

The Sterling crankless diesel engine, made by the Sterling Engine Co., Buffalo, N.Y., is being built in various sizes up to 500 horsepower at 1,200 rpm. These engines occupy less space than the crankshaft type of diesel and due to the design characteristics are rated for continuous duty at higher speeds. The intermediate sizes may be used at 900 rpm continuous 24-hour service, the smaller sizes at 1,200 rpm.

These are opposed piston engines, the pistons working in horizontal cylinders. The outboard ends of the pistons are closed off and fastened to a yoke arrangement, in which are mounted two ball-and-socket type thrust bearings. Two flywheels are mounted on the engine, one at each end. These flywheels are not at right angles with the shaft, but are mounted at a slight angle, and are referred to as "inclined discs." The combustion pressure is applied through the ball-and-socket thrust bearings, against the face of the inclined disc. The pressure against the angle of the disc causes the disc to move. The pressure is held by the mounting of the thrust bearings so that it is exerted against the flywheel, and cannot be dissipated in any other way.

The net result is smooth operation which is not experimental, as this type of thrust bearing is being used extensively in hydraulic turbines and other machinery.

New Light Grader for Maintenance

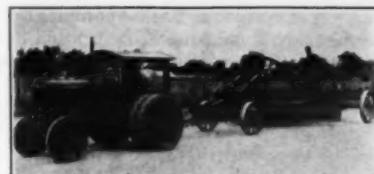
A 3,200-pound grader equipped with a 7 or 8-foot moldboard for operation with 10 to 20-hp tractors on maintenance and side road reshaping work has been announced by Foote Bros. Gear & Machine Co., Road Machinery Div., Joliet, Ill. This Model 40 Stockland grader is of standard straight-line construction with low head room to escape overhanging trees. The hand wheel controls are located in a convenient position in front of the operator's platform at the rear of the grader. When the grader is not needed for road maintenance the controls may be placed at the front of the grader in less than 15 minutes and arranged so that the tractor driver can operate both the grader and tractor.

The grader is of heavy construction, the frame being 6-inch channels and the drawbar of 3½-inch tee section. When used for continuous maintenance work, 10 to 12-foot moldboards can be handled.

Recorder Controls and Prints Weight of Aggregates in Batch

An automatic weighing and recording unit for attaching to the scale lever system of any batcher has been announced by the Streeter-Amet Co., 4101 Ravenswood Ave., Chicago, Ill. This Streeter-Amet Type L-8B recorder continuously measures out predetermined amounts of each ingredient of the batch, weighs it, records the weight and dumps the batch at the proper time. In addition to printing the actual weight of each ingredient, the recorder prints either zero weight or the actual weight of any material which may remain accidentally in the hopper after the batch is discharged. Another feature is the one-second time lag before recording each weight, thus allowing material falling from the hopper to the batcher to reach the weighing hopper and be included in each weight record.

The Type L-8B recorder can be arranged either to operate continuously or to stop automatically after filling the hopper so that dumping may be controlled by the manual operation of a push button.



A McCormick-Deering Model 30 Tractor and Galion No. 12 Grader Owned by Weld County, Colo.

Scenic Highways Lure Tourists to Colorado

(Photo on page 40)

El Paso County, Colorado, in which the famous resort cities of Manitou and Colorado Springs, Pike's Peak and the Garden of the Gods are located, years ago realized that a comprehensive system of improved highways was necessary to attract the automobile tourist, and so annual highway appropriations of from \$250,000 to \$300,000 have been

a regular procedure for many years.

Included in the recent purchases by the county is a TD-40 diesel TracTractor which has been used in heavy grading in Black Forest, north of Colorado Springs. The elevation in this forest is from 7,500 to 8,000 feet.

Another county in the state which has had a big problem in building and maintaining its highways is Weld County, in the northeast central part of Colorado and almost as large as the state of Connecticut. This county has used ten McCormick-Deering Model 30 industrial tractors and a fleet of thirty International six-speed dump trucks in its construction and maintenance program.

and the Washington shore for the convenience of its forces and visitors. The river is not wide but the current is swift and the launch is often loaded to capacity. As he boards the launch, each passenger is handed a Kapok vest and requested to wear it. So far as is known, none have refused. One look at the cold swift current is sufficient. This foresight might well be followed on other jobs.

—Construction Safety News Letter

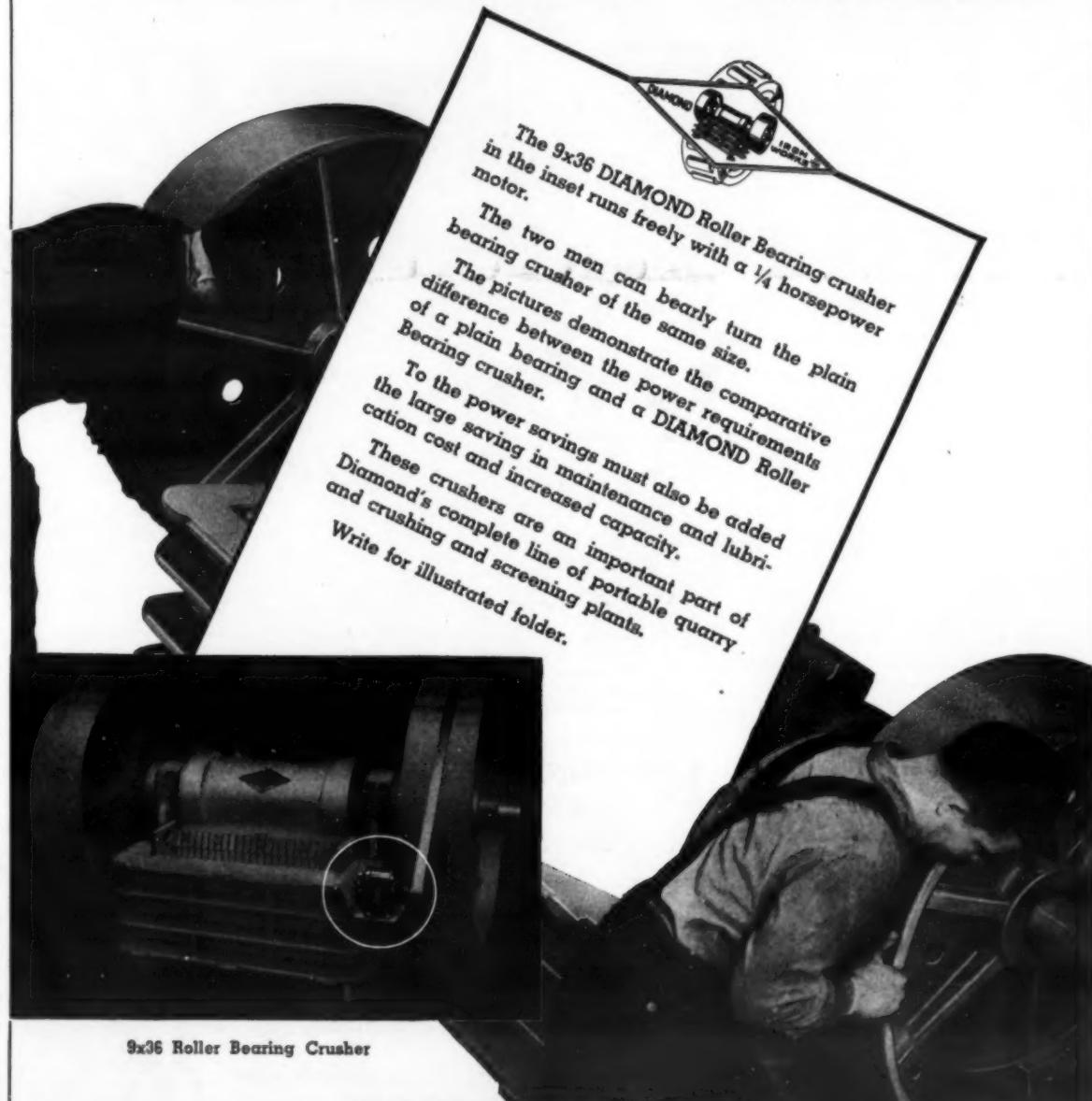
2" Self-Priming Centrifugal Pump

Easily carried by one man; 100% automatic. No handles or petcocks to be adjusted. Four-cycle engine with oil reservoir in crankcase. Easy to start—Speed control—Air cleaner. Foot and rope starters—self-oiling. Engine has only one place requiring lubrication. Ask for Specification Sheet 20A Marlow Pumps, Ridgewood, N.J.

Foresight

The Columbia Construction Co., general contractor on the Bonneville Dam across the Columbia River about 40 miles above Portland, Ore., operates a launch ferry service between the Island

WHY DIAMOND BUILDS ROLLER BEARING CRUSHERS



ESTABLISHED-1880

Diamond Iron Works, Inc.
MINNEAPOLIS, MINN. U.S.A.



General View of the Bonneville Model with Water Passing Through at Low Stage

Study Scour and Silting With Bonneville Model

In spending upwards of \$45,000,000 on Bonneville project, government engineers are not going at the work blindly. What is said to be the largest and most complete model of a river ever constructed is located at Linnton, near Portland, Ore. Engineers and their assistants are making tests there daily, of the most intricate nature. They are determining in advance how the Columbia River is going to react to the strangle hold being placed upon it by the dam.

Much information has been obtained which has helped the contractors in their work, particularly in connection with the cofferdams for the spillway. By actual demonstration, they are also determining in advance what the burrowing effect is going to be which might tend to undermine the spillways. Other studies not directly affecting the construction work, but nevertheless having a bearing on it are: deposition of silt below the dam, which would hamper navigation; removal of river bed obstructions above the dam, for controlling overflow of lands above while maintaining maximum head at the dam; type of fishway to be constructed, etc.

The model, including its reservoir, is 325 feet long. It is built on a scale of 1 foot to 100 feet and represents a stretch of river 5 miles in length. Constructed from records of thousands of soundings, every rock, islet or major obstruction shows up in the bed of the model. Water passed through the model for testing purposes is controlled so as to represent all stages from low water to flood. Another model constructed beside the large one shows two of the spillway sections to a scale of one to thirty.

The work comes under the United States Engineers office: Col. T. M. Robbins, Division Engineer; Major C. F. Williams, District Engineer; C. I. Grim, Chief Civilian Engineer. The Chief Engineer of the Linnton Hydraulic Laboratory is A. J. Gilardi.

Contractor Weighs Rock for Long Beach Breakwater

(Photo on page 40)

In order to keep an accurate record of the amount of large rock used in the new Long Beach, Calif., breakwater, the Rohl-Connolly Co. of Los Angeles is weighing every rock as it is loaded at the Catalina Island quarry. This contractor is now building the second unit, 4,000 feet in length, of a 12,500-foot extension of the Long Beach-Los Angeles breakwater which will, when completed, give to Long Beach and the outer harbor of Los Angeles a greatly enlarged still-water anchorage sufficient to accommodate the United States Fleet.

Four barges a day are operated from Catalina Island bringing the "B" rock which is used for the light bottom rock,

heavy pieces that a 40,000-pound Fairbanks crane scale is used, interposed between the crane hooks and the rock sling.

The entire stretch of breakwater will require from 4,000,000 to 5,000,000 tons of rock and will cost approximately \$7,000,000. The breakwater begins 2 miles south of the Long Beach breakwater and extends toward the San Pedro breakwater. The second unit will be completed sometime during 1935.

Picks and Shovels

(Continued from page 1)

do a little missionary work in Latin America.

Few if any of the countries in Central and South America seem ever to have heard of guard rail, much less purchased any. Having driven over some of those circuitous roads, winding up into the mountains which tower above the seaports, twisting and turning

around high ledges of rock or embankments covered with a luxuriant tropical growth on one side, and a sheer drop into the valley—and oblivion—on the other, I speak with feeling on the subject of safety guard rail at those points.

We have no statistics at hand to show how many people have plunged to their death at unguarded curves in the roads of Latin America—I doubt if any are available—but certainly a bit of good guard rail at those curves would greatly enhance, for visitors at least, the pleasure of the drive, the beauty of the scenery and quiet their heart beats!

New Le Tourneau Branch

R. G. Le Tourneau, Inc., Stockton, Calif., has announced the opening of a branch in Peoria, Ill., last month. R. G. Le Tourneau has been east making final arrangements for the factory and office buildings and Howard Peterson, Vice President, will be in charge of the factory, service and general field work.

KOEHRING



Dandie mixers

**7-S 2870 lbs.
10-S 3800 lbs.
14-S 4975 lbs.**



The Koehring Automatic Skip-Flow Shaker, shakes the skip perpendicularly, without strains to the mixer. The aggregate moves along the natural flow-line of the skip.



KOEHRING DANDIE MIXERS, designed for light weight, with ample strength, have every modern feature for fast and convenient operation. Full spring mounting, full anti-friction bearings, automatic skip-flow shaker, short wheel base, silent V-belt drive, are important advantages of these modern mixers.

The Dandie Trail-Mix is narrow in width and correctly balanced for hauling or mixing. The obstruction-free charging skip permits fast and easy loading of material.



KOEHRING COMPANY
Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Losing Profits Through Lost Time

(Continued from page 6)

pear to be satisfactory and do not result in excessive shoving. In general, higher speeds are used on the base than on the surface course. Typical rates observed were 2,833 square yards per hour on surface and 3,080 on base. The number of rollers required on a project might be estimated as follows:

	Base	Surface
Plant production—linear feet of road per hour	439	567
Surface laid per hour (20-foot width), square yards	975	1,260
Number of times rolled	4.39	11.13
Area to be rolled per hour, square yards	4,280	14,030
Square yards per hour per roller exclusive of time losses	3,080	2,833
Percentage of working time utilized	81.7	88.3
Square yards per hour per roller allowing for time losses	1,590	2,500
Number of rollers required	3	6

Here again the difference in thickness of base and surface course leads to an increase in the equipment required to keep pace with maximum production. In this case the thicknesses might have been adjusted so that four rollers would have been adequate for the project instead of six.

Observations of volume reduction resulting from rolling were made on selected sections of project A (Table 8). Measurements of thickness before and after rolling are based on level readings taken at 1-foot intervals on transverse pavement sections. On given days observations were confined to a particular course and measurements taken on fifteen or twenty transverse sections. The results are shown in Table 9. Each figure in the table is the average of observations at over 200 points.

These data show that the reduction of volume of the surface course was somewhat less than that of the base course, although the top course received twice as much rolling as the base. The variation from the average was much greater for the surface course than for the base. The base and leveling courses were of identical mix and the average reductions in volume are identical. The surface was composed of a quite different mix and showed different characteristics under rolling. Variations in the temperature of the material as delivered possibly affected the results.

Table 9.—Reduction in Thickness of Base and Surface Courses Due to Rolling

Course	Loose thickness Inches	Compacted thickness Inches	Reduction in volume Per Cent
Base:			
First day	3.77	2.77	26.5
Second day	4.96	3.81	23.2
Third day	3.63	2.62	27.8
Average	4.12	3.07	25.6
Leveling:			
First day	2.55	1.75	28.6
Second day	2.42	1.85	23.6
Third day	2.68	2.02	24.6
Average	2.52	1.87	25.6
Surfaces:			
First day	2.44	2.01	17.6
Second day	2.36	1.70	25.0
Third day	1.78	1.26	29.0
Fourth day	2.69	2.12	21.2
Average	2.32	1.77	23.5

These facts suggested the existence of inherent qualities in the mix affecting the uniformity of volume reduction and led to a series of investigations of the effect of rolling. Batches of various proportions were prepared, spread on the road surface, and subjected to various amounts of rolling with rollers of different weights. The general indication resulting from these tests is that the voids in the mixture are reduced to a minimum value early in the rolling process. On jobs using a light roller on sheet asphalt the point at which there appeared to be no further void reduction or increase in stability was reached after eight to twelve rollings, depending upon the composition of the mix.

In the rolling tests of asphaltic concrete mixtures, determinations of the density of samples cut from the rolled pavement were made and compared with the theoretical maximum density (no voids) as computed from the quantities and specific gravities of the constituent materials. These data were determined from analysis of samples.

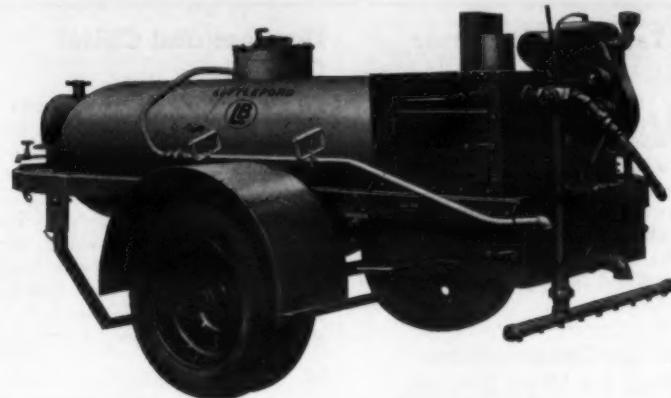
The results of the tests indicate that in general the weight of the roller and the number of rollings above an essential minimum has less effect on the density attained than does the gradation of the aggregate.

It is believed that rolling to produce compaction should be done entirely in a longitudinal direction and that rolling to produce surface smoothness should follow immediately in transverse and longitudinal directions. The entire rolling should be completed before a considerable drop in temperature has taken place and curved or diagonal rolling should be avoided because of the detri-

mental effect on smoothness. The data shown in the Table 10 are typical of the rate at which cooling may take place. The heaviest rollers were used

in the first stages of rolling and those of lighter weight were used in the finishing operations which took place

(Continued on page 33)



MAINTENANCE EQUIPMENT

takes a Step Forward!

Save on cost of bituminous material—use No. 101 and you stop paying package prices. Save on handling—take material to the job in No. 101 ready for application. No longer will you have to load a truck with drums to be distributed along the roadside.

The No. 101 Utility Spray Tank is our latest contribution to the highway industry. It is made in capacities from 300 to 800 gallons—mounted on two or four-wheeled running gear. It has an air-cooled engine, Viking pump, heat flues and oil burners—handles any kind of bituminous material.

No. 101 may be fitted with as many Hand Spray Attachments as your crew can efficiently use—spray is individually controlled from the Spray Handle. The four-foot spray bar is merely supplementary but comes in mighty handy where light oiling is called for and on large skin patching jobs.

Let us tell you more about No. 101. Write for complete information and prices. It will cost you nothing to learn all about this remarkable, low-cost maintenance unit.

LITTLEFORD
Road Maintenance Equipment
SINCE 1900
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

**ACCURATE WEIGHT ON
Every BATCH**

When a Fairbanks Hopper Scale is on the Job

- In the central mixing plant or in batching operations, Fairbanks scales mean all 'round savings. Insuring uniformity for every batch, they weigh every ingredient accurately and speedily, keeping the mixers supplied as fast as the hoppers can deliver their loads.
- Automatic recording, providing a printed record of weights, insures accurate records of materials received, handled and delivered. Makes accounting easy and prevents losses through wasted materials. This printed record serves as permanent proof of character of mix used both for record and contract purposes.



Fairbanks Dial Hopper Scales at a contractor's plant in St. Louis. Accuracy with greater speed in weighing is a feature of this installation.

Where concrete is being mixed—anywhere from a small wheelbarrow-trundling job to a giant bridge, there's a special Fairbanks scale to guard your profits by insuring accuracy in weight and proportion of mix. For full information, write Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. And 40 principal cities—a service station at each house.

Fairbanks Scales

OFFICIAL SUPPLIER TO THE CONCRETE INDUSTRY

6840-SA 31.17

NEW FROM STEM TO STERN!



THE NEW HUBER ROAD ROLLER!

Huber scores again with a new improved hydraulic controlled road roller. Simple, rugged, powerful, fast, smooth—this new modern road roller has everything. It's the last word in road roller construction, built to give years of trouble free, economical service. Don't buy a roller until you have investigated a HUBER. And once you investigate it, you'll buy it.

THE HUBER MANUFACTURING CO., MARION, OHIO

How the Other Fellow Did It

Ideas Which Have Already Proved Helpful to Contractors

Drag Template for Paver

357 A drag template, which was particularly effective because it could be readily adjusted, was found on a southern contract. It was made up of a 6-inch channel iron with a 3/16-inch plate riveted to the leg which was turned down. This plate carried a 2 x 2-inch angle iron with slotted holes and bolts on 1-foot centers so that the template could be adjusted to different specifications. 27.3.18

Water for Construction Supplied by Well Points

358 To supply water for two 10S concrete mixers and other jobs where water was required for the construction of a new hotel on the Saratoga Springs, N.Y., reservation, J. J. Turner & Sons of Amsterdam, N.Y., contractor for the job, drove four 1½-inch 100-mesh well points, made by Youngstown Steel Products Co., 20 feet into the ground and tapped them into a 10-foot section of 6-inch pipe with sealed ends. The suction line for a 2-inch Marlow self-priming centrifugal pump was tapped into the 6-inch header pipe.

The average demand for water on the job was only about 28 gallons per minute but this installation was able to supply about 120 gallons per minute. The engine was throttled to about half speed and left running all day. In this particular location there is plenty of water in the subsoil and the pump very seldom had to re-prime itself.

During the winter the pump was moved into a tool house. One well point at a depth of 20 feet, coupled direct to the suction end of the pump, supplied all of the water used. During this time water was pumped to a small storage tank because the soil around the one well point was completely drained and the pump ran idle until the ground water flowed into the well point again. N.Y.35

Sprinkler Hose on Rollers

359 An Illinois contractor recently followed out the scheme which had been used in the streets of Paris for many years in placing his sprinkler hose on rollers. While the city fathers of Paris placed the hose on caster wheels, the contractor used rollers from 12 to 15 inches long on top of which were mounted spray nozzles. This gives a very mobile unit. M.6.34



The Williams "Champion" Power-Arm Bucket is FASTER ACTING because of shorter cable overhauls—and is SUPER-POWERFUL because of its exclusive power-arm combination of lever and block-and-tackle. Write for Bulletin.

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

WILLIAMS
BUCKETS

Hammer and Chisel Gang Gone

360 Work that previously represented days of hard labor for the hammer and chisel gang in removing rivets is now only a question of hours of easy work with the regular oxy-acetylene cutting blowpipe. For this work contractors are using the low-velocity rivet cutting nozzle very effectively. O.A.T. 12.34

Steel Bars for Curb Forms

361 In a Southern state where lip curb is built on all grades and on the inside of all curves, a contractor used as forms for finishing the curb extra heavy tool steel bars 1¼-inch square and 10 feet long with projecting

pins to which the clamps could be attached. The clamps were placed two to a bar about 1 foot from each end. The use of the tool steel gave a solid

piece of metal not easily disturbed in finishing the form. They were, however, heavy and not easily moved forward. 27.2.23

PORTABLE ASPHALT PLANTS

TOWER TYPE

LARGE CAPACITIES
HOT OR COLD MIX

Accurate control of materials to comply with any standard specifications for bituminous mixtures.

Send for Bulletin T-248

HETHERINGTON AND BERNER INC

Indianapolis, Indiana

GMC THE TRUCK OF VALUE

47 Reasons why it will out-perform and out-earn



47 important quality features assure better performance and greater earnings for owners of the GMC 1½-2 ton truck

If you want this combination of 47 quality features that not one leading competitive truck offers, then see, inspect, test and compare the many-feature GMC 1½-2 ton that out-performs and out-earns on any sound basis of comparison.

Yes, 47 important quality features, 10 of them exclusive to the GMC among leading 1½-2 ton trucks! In fact, this many-feature truck out-scores each leading competitor in many respects. Out-scores them on such important counts as greater payload capacity, latest type Lockheed hydraulic brakes with economical centrifuse brake drums and larger brake lining area, greater horse-

power, greater sustained torque and full-floating axle with straddle-mounted pinion, to cite but a few money-saving superiorities.

Before you buy any size of truck, look first to the General Motors Truck Company, the world's largest manufacturer of commercial vehicles exclusively. Whatever your hauling needs may be, there's a truck or truck-with-trailer that is correctly engineered to fit your needs exactly and haul your loads more profitably. Capacities range from 1½ to 22 tons.

For startling performance and greater economy

See the revolutionary dual performance axle now available in the 2-3 ton range. It provides a high-high gear (5.14 to 1) for fast movement on the level at economical engine speed and a low-high gear (7.15 to 1) which assures improved performance with heavy loads on hills or where the going is hard.

A Typical Value Fact

It costs more to equip the quality 1½-2 ton GMC with Drop-Forged Wheels but they are 2 to 3 times stronger than other types. Furthermore, the rims are part of the wheels—therefore tires are always in perfect alignment, with the result that tire life is greatly lengthened.

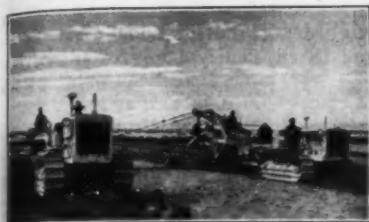
GENERAL MOTORS TRUCKS & TRAILERS

1½ - 22 TONS

GENERAL MOTORS TRUCK CO.

Time Payments Available Through Our Own Y.M.C.A.

PONTIAC, MICHIGAN



Caterpillar Tractor and Elevating Grader Moving Dirt on the Vaal-Hartz Irrigation Project in South Africa

New Canal Started In South Africa

Economy in dirt moving was recently attained in South Africa where a new canal is being built on the Vaal-Hartz Project by the Irrigation Department of the Union of South Africa. Caterpillar diesel tractors pulling Caterpillar elevating graders were used for excavation. This equipment averaged 320 yards an hour for 100 working hours on a recent test, moving the dirt at an average cost of 3 cents a yard. The project calls for the excavation of 750,000 cubic yards which must be moved a second time to leave a 15-foot berm on either side of the canal.

When completed the canal will be 23 feet wide at the top and 18 feet wide at the bottom with an average depth of 6 feet.

Cleaning Guard Rails With Vapor Spray

In the state of Washington the expense of painting highway guard rails to make them readily visible at all times resulted in experimental work on methods of cleaning the guard rails. The cost of painting, including labor, brushes and material amounts to 5½ cents per square foot and traffic dust and dirt quickly obscures the painted surface. The Highway Department experimented with a Hypopressure Jenny, made by Homestead Valve Mfg. Co., Coraopolis, Pa. The cost of cleaning by this method, including a depreciation reserved to allow purchase of new equipment every five years, water, cleaning compounds and labor, amounted to 1.4 cents per square foot. A close check showed that at least one painting operation is saved through this method of cleaning.

The equipment consists of a 600-barrel water tank, a motor generator and cleaning compound barrels mounted on a Washington State Highway truck. Two outlet vapor lines are piped from the cleaner, one extending to the front of the truck and the other to the rear. To each of these lines is attached a 25-foot length of hose with a single gun and 2-inch flat nozzle. The man at the front of the truck, with the control valve on the gun half open, cleans the posts and keeps the guard rail thoroughly wet. The man at the rear uses full pressure, completely cleaning the rail. This same outfit is used to clean bridges, abutments, overpasses and center lines as well as keeping the entire construction equipment cleaned.



Cleaning Guard Rail on a State Highway in Washington

Self-Clearing Road Ripper

A road ripper so constructed that the teeth swing up and back on an arc for clearing the ripper has been announced by Continental Roll & Steel Foundry Co., 332 So. Michigan Ave., Chicago, Ill. The machine is used for ripping up old gravel, macadam, asphalt roads and streets, or loosening earth surfaces. The RollClear feature permits roots, rocks and debris caught in the teeth to drop clear. When the teeth or standards are raised, they make a complete circle about the rotating tool head before entering the ground again.

The operations are controlled either hydraulically or by a hand-operated cable from the tractor. In the hydraulic model the jack or cylinder is located on the ripper frame. This cylinder raises and lowers the wheels, assuring positive cutting and regulation of the depth of cut.

The ripper is carried on two cast-steel wheels, mounted on Timken bear-

ings. The rolling head is mounted on bronze bushings, with high-grade dust seals to protect the bearings and bushings. The five standards which hold the teeth are arranged to make a V formation of the points. The teeth are locked to the tool head with a wedge, making it easy to remove or add teeth.

6-Cylinder Diesel Tractor Has Electric Starter

A full diesel 6-cylinder tractor in the medium power class and equipped for electric starting has been announced by the Cleveland Tractor Co., Cleveland, Ohio. The new Cletrac 40 diesel delivers 46 drawbar horsepower and 60 belt horsepower. In first gear the drawbar pull is 9,600 pounds, in second gear 6,000 pounds and in third gear 3,500 pounds. The tractor, equipped with standard grousers, weighs 11,500 pounds.

The standard track is 15 inches wide,

giving a total ground area of 1,950 square inches. The ground pressure of the standard model is 5.8 pounds per square inch. The tractor is 132 inches long overall and 65½ inches wide.

South Bend

Bituminous Pressure

Distributors

Street Flushers

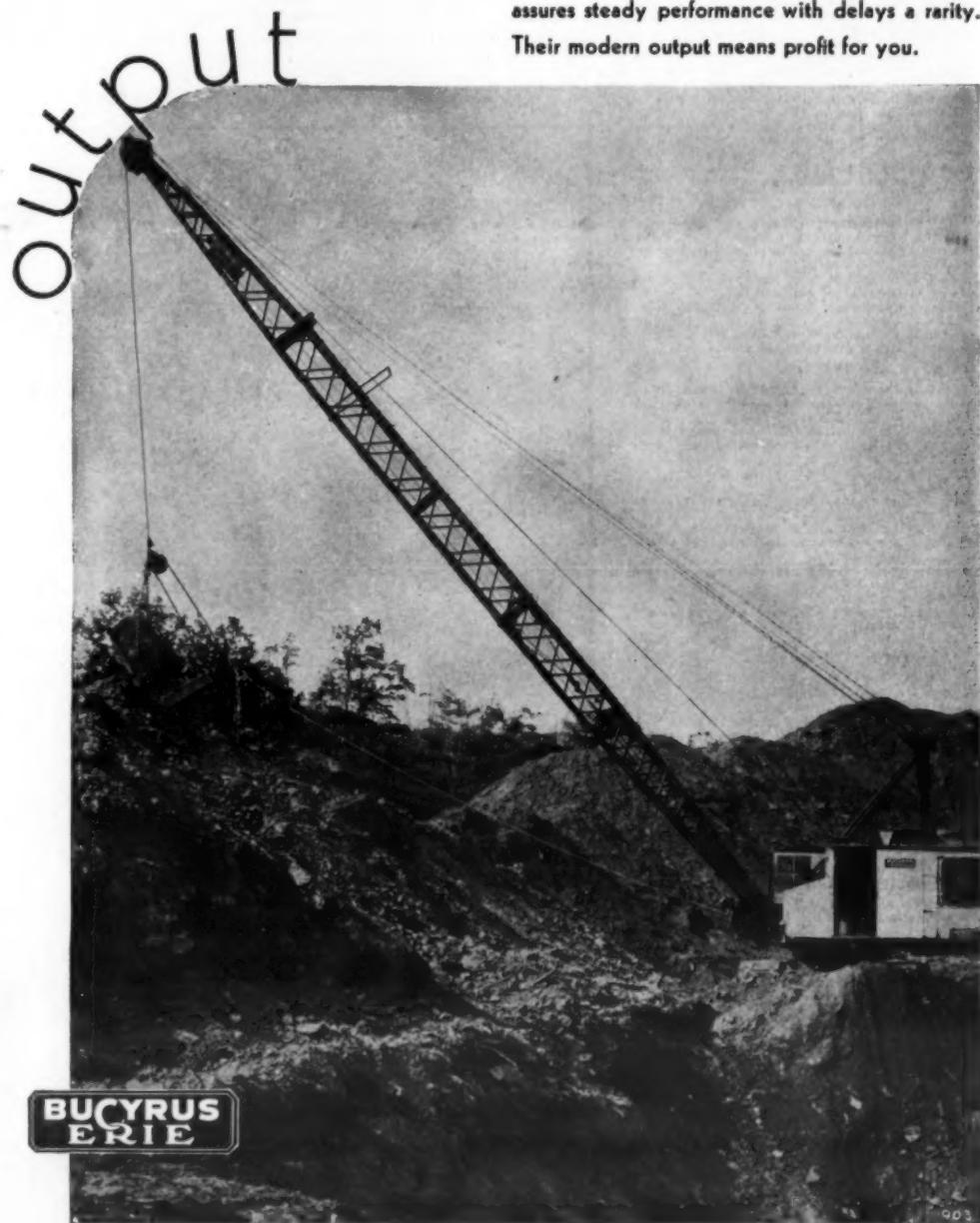
Street Sprinklers

Literature and prices on request

MUNICIPAL SUPPLY COMPANY

SOUTH BEND, INDIANA

OUTPUT increases materially when modern Bucyrus-Erie are put on the job. They have the speed and power to hustle through tough going. They have controls so responsive and easy to handle that continued smoothness and accuracy of operation can be maintained over long periods. Their durable construction assures steady performance with delays a rarity. Their modern output means profit for you.



**BUCYRUS
ERIE**

BUCYRUS - ERIE

EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

"Trouble Shooting" for Motor Trucks

Hints on Maintenance and Care of Your Trucks Which Will Prove to be Time and Money Savers

By FREDERICK W. KOERBER

THERE are three factors of truck operation in which every truck owner should be interested, whether his fleet is two or two hundred vehicles. These factors are efficient operation; economical operation, and safe operation.

Most truck owners endeavor to employ drivers who are efficient, safety-minded and capable in most respects, but can these men tell offhand what is the matter with the trucks they are driving when something goes wrong, or do they depend entirely upon the garage mechanic to diagnose the trouble?

For Driver's Attention

MOTOR

- Check timing of motor.
- Tighten all motor support bolts and cylinder head, oil pan and exhaust manifold nuts.
- Remove and clean oil filter at least once a month.

LIGHTS AND BATTERY

- If ammeter shows greater discharge than 16 amps with all lights on, have generator examined and properly adjusted.
- Check headlight ground connections, reflectors and voltages on all lights; also candle-power.
- Test dimmers.
- Examine all contacts and sockets for loose connections.
- Examine and clean fuse clips.
- Test all buzzer buttons and contacts.
- See that battery is properly filled with distilled water.
- See that battery is held securely in place.
- Test voltage at terminals and each cell separately if below proper voltage per battery chart. Should not be below 12 volts at terminals.
- Test gravity and if below 1,200, remove battery to battery room for examination.

SPRINGS AND FRONT END

- Tighten front spring clip nuts.
- Tighten rear spring clip nuts.
- Apply light engine oil to spring lever and shackles if squeaky.
- Check alignment of front wheels.
- See that front wheel nuts are tight.
- Examine front wheel bearings, rods and spindles.
- See that shackle bolts are in order.
- Inspect torque brackets and rods.

BRAKES

- See that there are no cracks in brake drum.
- Remove rear wheels and examine brake lining. If worn, replace.
- Lubricate all clevises, pins and connections, and remove and replace all rusted items such as cotter pins, etc.
- Examine propeller shaft brake and adjust if necessary.
- See that emergency brake ratchet is in proper order.
- See that boosters are in proper order.
- Examine air lines and inspect gages where air brakes are used.
- Clear all air lines, brake chambers and inspect for air leaks.
- Check compressor air supply.
- Inspect compressor brackets and compressor belt.
- See that all wheel bearings are properly packed with grease.

TRANSMISSION—CLUTCH—REAR

- Remove transmission top and examine gears.
- Look for loose bearings.
- Remove clutch inspection plate. Inspect and if necessary, adjust clutch. Oil clutch pedals.
- Examine rear axle, rear bearings and gears. Tighten axle housing bolts.
- Inspect universal joints.
- See that propeller support bearing is properly lubricated.
- Check transmission and differential adjustment.
- See that radius rods and torque arms are tightened.
- Tighten rear wheel nuts.

STEERING INSPECTION

- See that all parts are properly lubricated, particularly the steering knuckles.
- Have steering gear adjusted.
- Be careful not to adjust steering gear too closely, or hard steering will result.

BODY AND GENERAL INSPECTION

- Inspect gasoline tank for leaks.
- Inspect windshield wiper and see that cleaver operates freely.
- Inspect ventilators.
- See that license plates and brackets are in order.
- Inspect roof for leaks.
- Examine frame for cracks or loose rivets.
- Inspect and tighten all body bolts.
- Inspect exhaust pipe; mufflers.
- Test heaters and valve.
- Tighten all sashes.
- Inspect windshield operation and rubber.
- Oil doors.
- Inspect seat cushions and brackets.
- Examine skirts.
- See that fire extinguishers are in order and filled.
- Tighten fenders and bumpers.
- Inspect hood for rattling. Tighten.

Sufficient information should be given to truck drivers to enable them, with a little careful study, to diagnose all or-

Truck Lubrication Chart

Lubricate every 50 miles
Crankcase oil replenishment
Lubricate every 300 miles
Starting motor bearings
Generator bearings
Distributor shaft bearings
Water pump shaft bearings
Overhead valve rocker-arm assembly
Fan bearings
Clutch release bearing (plain-bearing type)
Internal gear axle, final drive gears (grease exp.)
Spring shackle bolts
Steering knuckle pivots, tie rod and connecting rod
Lubricate every 500 miles
Drain crankcase oil (in winter 500 miles, in summer, 750)
Lubricate every 400 miles
Clutch release bearing—ball-bearing type
Universal joint
Lubricate every 1,000 miles
Engine support arm
Replenish transmission grease
Replenish differential grease
Drive pinion bearings, where separately lubricated
Internal gear axle, packed with grease or filled with oil; replenish
Spring seats
Spring leaves, oil
Clevis and toggle joints
Steering gear housing
Lubricate every 2,000 miles
Refill clutch, wet-disc type
Leather oil dressing to clutch (leather face, cone-type)
Wheel bearings: replenishment
Speedometer cable
Lubricate every 5,000 miles
Transmission, drain and fill
Differential, drain and fill
Internal gear axle—final drive gears: clean and refill
Wheel bearings, clean and repack
Spring leaves, enclosed in covers: semi-fluid lubricant

A periodic inspection of all parts, as noted above, will effect large savings in repairs as well as insure the continued satisfactory operation of the trucks without interruption. These suggestions, with the following mileage lubrication chart to be followed regularly, will keep your trucks in tip-top condition.

Subsequent issues of CONTRACTORS

AND ENGINEERS MONTHLY will contain more detailed suggestions on the care and lubrication not only of trucks but also from time to time on other pieces of equipment. A little time and thought invested in the proper maintenance of equipment often means hours of valuable time and many dollars saved in the long run.

There are more Buffalo-Springfields on the roads and streets of America than all other makes of roller combined.

Surely such widespread acceptance must weigh heavily with those who are called upon to choose the roller upon which they can rely for dependable, economical, long-time service.



Buffalo-Springfield Rollers are obtainable in sizes from 1½ to 17 tons, three-wheel or tandem. Scarifier and other attachments optional. Write for our complete catalog, or tell us your needs.

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Springfield, Ohio
U. S. A.

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OIL, TAR AND ASPHALT DISTRIBUTORS



Etnyre Model M02C Spraying 20-Ft. Road

Concrete Finishers for Aqueduct Canal

The Colorado River Aqueduct project of the Metropolitan Water District of Southern California is so large that it has required the design and construction of a number of new machines and the adaptation of old ones. The Lakewood concrete finishing machine which has been used for many years for finishing concrete roads has been equipped by Jaeger Machine Co., Columbus, Ohio, with special screeds having a negative crown and with special suspension so that when the screeds traverse the invert, the true radius is maintained.

The finisher is driven by a 4-cylinder gasoline engine, has multiple speeds both forward and reverse and is equipped with two screeds. The frame and driving axle are telescoping so that the same unit can be used on either the narrow invert of the rock cut conduit or the wide invert of the earth cut conduit. The same screeds are used for either type of cut and when the wide invert of the earth cut conduit is encountered, special strike-off wings are used on either side to strike off the concrete for the additional width and provide the keyway joint for the conduit arch.

These machines can also be equipped with an electric generator set for electric motors installed on the screeds for vibrating the screeds at high speeds.

Thompson-Starrett Co., Barrett & Hilt and Macco Corp., have each purchased one of these machines from Smith Booth Usher Co., Los Angeles, Calif., and the Griffiths Co. has purchased one equipped with electric vibrators on the screeds.

Miss. Experiments on Sand-Clay Base

(Continued from page 8)

trucks and gave a final uniform distribution of the gravel over the surface.

At this point trouble was experienced by the broom drag leaving the gravel in ridges or piles due to the primed base being smooth, and there being nothing to hold the aggregate in place under the brooming action. This was overcome by applying a "tack" coat of emulsion, using 0.15 gallon per square yard after which no further trouble was experienced.

The surface was then rolled with a 10-ton, 3-wheel Galion gas roller to key the gravel in place. The gravel was uniformly covered with an application of 0.45 gallon per square yard of Bitumuls HX having a penetration before emulsion of 150 to 200. The emulsion broke within 30 to 40 minutes and the section was covered with 0.15 cubic foot per square yard of $\frac{1}{4}$ -inch crushed gravel laid down with the Stolle spread-

Lighter weight means 15% bigger pay-load

By making the pan and frame of the HYB-LUM Wheelbarrow of high-strength nickel-aluminum alloy, we have reduced the weight 40 pounds. Note also the pneumatic tires for smooth, easy traveling.

Sheet Aluminum Corporation, Jackson, Mich.



The Specially-Designed Finisher for the Inverts of the Colorado Aqueduct Project

ers, hand-broomed, gang-broomed and rolled.

The next step was to apply 0.25-gallon per square yard of the emulsion covering with 0.1 cubic foot of chips per square yard, brooming and rolling, and finishing it off with 0.35-gallon per square yard of the emulsion. It was then covered with another 0.1 cubic foot per square yard of the coarse sand and the other operations repeated. The road was immediately opened to traffic and furnished a $\frac{3}{4}$ -inch wearing surface of excellent non-skid qualities.

Labor Organization

As this was an NRH-NRM project labor was worked 30 hours a week. On base one crew was started at 5 A.M. and worked until noon and a second shift from noon until 7 P.M. This gave the men four 7-hour shifts a week for common labor which was as near as it was possible, under this arrangement, to give the 30-hour week. Skilled operators were allowed 40 hours a week so they worked six 7-hour shifts and usually lost the 2 hours, or more, through weather conditions. The organization was the same for working on the top. The total payroll reached a maximum of 100 for all shifts with an average of 30 men per shift.

Personnel

This contract, which was awarded to Barber Bros. Contracting Co., of Baton Rouge, La., for \$68,546.10, was completed the latter part of September, 1934. For the contractor the work was in charge of Hugh Worley, Jr., as Su-

perintendent, and R. L. Wells was Resident Engineer for the State Highway Department of Mississippi.

TRY THIS HOBART WELDER FOR 30 DAYS—AT OUR RISK

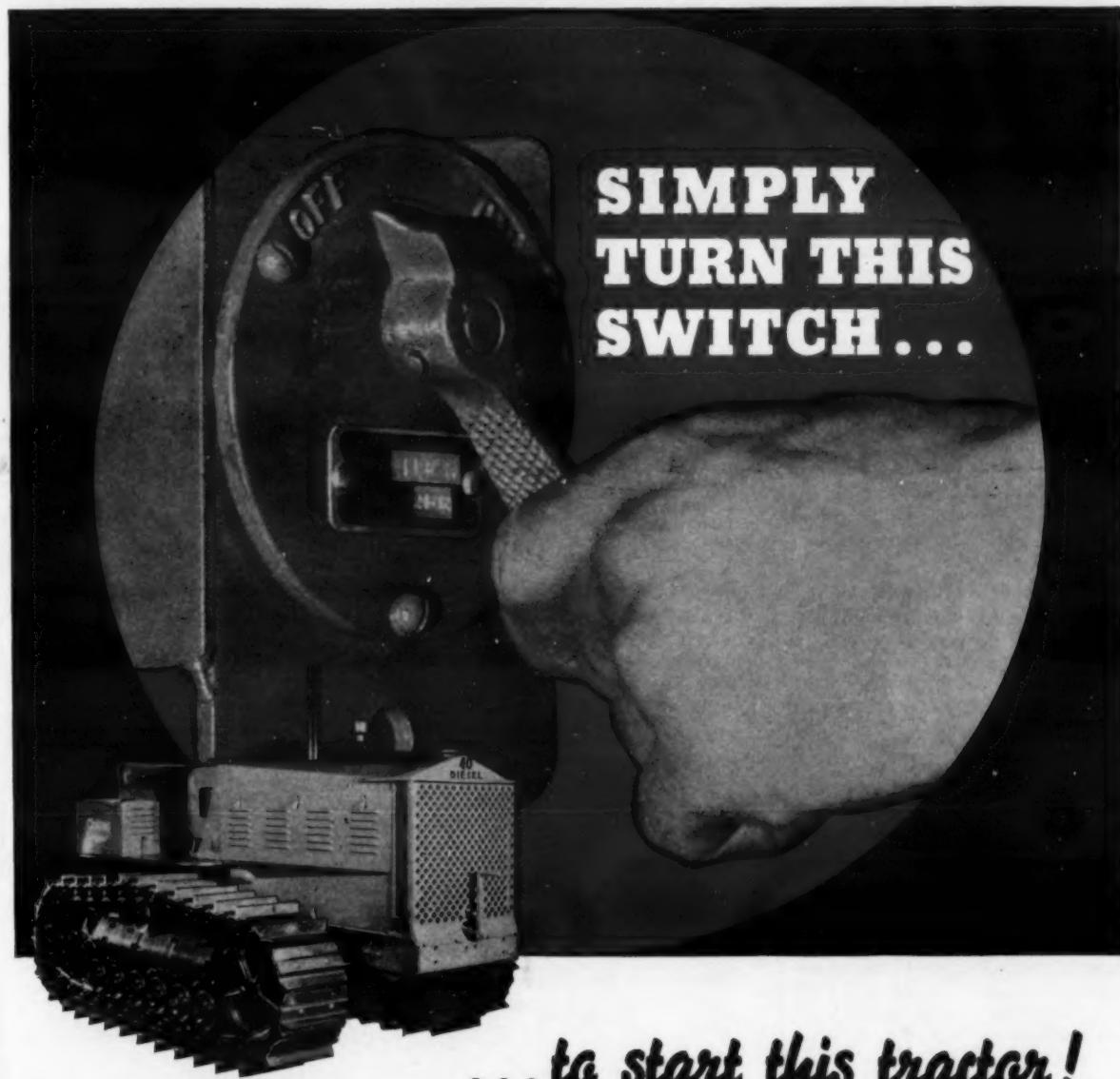


The Remote Control feature—at no extra cost, makes it a time saver and money maker

The new 40 Volt welding makes it the most practical welder for any job—no matter how large—no matter how small. Hobart is faster, costs less to operate.

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SIMPLY
TURN THIS
SWITCH...

...to start this tractor!

Electric Starting brings to Diesel tractor operation all the advantages of a quick starting engine. No extra engine is needed to start the Cletrac 40 Diesel... no extra starting time required. Simply turn a switch and the 40 Diesel is on the job.

The smooth power of six cylinders and the inherent advantages of Cletrac design produce operating efficiency that makes those "tough jobs" easy... and operating economy that makes those "high costs" take a nose dive.

THE CLEVELAND TRACTOR COMPANY, Cleveland, Ohio



CLETRAC CRAWLER TRACTORS

Concrete Pipe Laid in Ten Days

(Continued from page 1)

junction of the Y to be assembled with the completed steel cylinders.

Producing the Steel Cylinders

The steel cylinders were made from flat sheets of No. 14 gage steel, delivered by the railroad to the other branch of the Y. The flat sheets were first placed on a layout table, and then passed through electrically-driven rolls to curve them to the proper radius. Four of these curved sheets were assembled into a cylinder with longitudinal seams, by temporarily riveting them with square cut boat nails to end assembly rings. These cylinders were carried to a pneumatic press which clamped together the edges of adjoining sheets, one seam at a time, so that they could be electrically-welded by hand, using Lincoln Stable Arc welders. When all seams were welded, the temporary rivets were knocked out, the end assembly rings removed, and four lugs formed at each end of the cylinders by bending out a small section of each sheet. The cylinders were then set up vertically on a special expanding mandrel, a galvanized steel bell ring placed in the machine, the cylinder telescoped inside of it to a distance determined by the lugs, and the mandrel expanded to clamp the ring and cylinder together during welding. The faces of the mandrel were sheathed with copper to prevent burning the sheets or fusing them to the machine. The welding was done by hand, the cylinder reversed and the spigot ring welded on the other end in a similar manner.

When the welding was finished, the completed cylinders were tested for strength and leakage by water pressure. After passing this test, they were rolled to the junction of the Y and placed inside the reinforcing cages. The complete steel assembly was then rolled to the concrete casting yard.

Producing the Concrete

A compact central mixing plant, designed for truck delivery of aggregates and the use of bag cement, was located between the junction of the Y and the casting yard. Screened gravel $\frac{1}{4}$ -inch to $\frac{3}{4}$ -inch sizes and sand were delivered by truck to a hopper at the base of the plant and raised by bucket elevator to the Blaw-Knox bins equipped with volumetric batchers. The cement was handled direct from the freight cars to the mixer by small hand trucks. The proportioned aggregates and cement were combined with a water-cement ratio of 5.3 and mixed three full minutes in a Rex 27-S mixer, producing a concrete of about 9-inch slump. Under these methods an average of about $2\frac{1}{4}$ barrels of cement was used per cubic yard of concrete.

Casting the Pipe

The pipe casting yard was arranged in a circle divided into four sections. Three of these sections were used alternately to cast and cure one day's production of 24 pipes, 12 feet long. The fourth section served as a working space in which the forms were cleaned and oiled before each day's pouring. At the center of the circle a Northwest crane was mounted on heavy timber cribbing about 5 feet above ground level, enabling the operator to see over the tops of the forms and pipes as they stood on end in the circle.

The sequence of operations for each day was first to strip the forms from the pipes cast the previous day, leaving the pipe standing to be covered later with canvas and cured with saturated steam until the afternoon of the following day. The forms were placed in the working section of the circle to be cleaned and oiled. The second operation was to set



C. & E. M. Photo
A 12-Foot Length of Pipe in the Specially-Constructed Cradle to Transport It to the Job

up the cleaned forms, including reinforcing cages and cylinders, in a section of the circle from which previously manufactured pipe had been removed the day before. The third operation was to pour the concrete in the forms. The Northwest was so located it could lower a concrete bucket directly under the

chute from the mixer and then swing it over the tops of the forms. This bucket was conical in shape with a ball plug at the bottom which permitted bottom dumping and accurate control of the quantity of concrete to be dumped. As each form was filled, laborers ran long tamping tools down into the concrete

to distribute it thoroughly and eliminate voids. After some 25 minutes a second and third tamping were done, to bring any excess water to the top of the forms. The fourth operation was to remove the steaming canvas from the pipes being cured, tip the pipe and roll them into storage, where each pipe was numbered, dated and allowed to cure further in air for seven days before being hauled to the trench.

Hauling the Pipe

Special trucks, having 12-foot bodies equipped with a cradle consisting of two 4-inch steel pipes running the length of the body, were used for hauling the pipe from storage to the trench. A T-shaped depressed roadway permitted a truck to drive in with the body level with the rails of the storage yard. The driver and a helper rolled the pipe forward on the rails to the edge of the depressed roadway and over skids to the steel pipe cradle on the truck, where it was lashed in place to be hauled to the trench. The

(Continued on page 30)

"I like the heft of it!" . . . says the workman

**THE WOOD SHOVEL AND TOOL CO.
"CLOSED BACK"
PIQUA, OHIO, U.S.A.**

WE wanted to know what shovel-users think of Wood's new Closed-Back Shovel. First workman to be questioned was Frank Maloney, 11733 Geraldine Avenue, Cleveland, Ohio. To Frank a shovel is business, daily work for daily bread. Frank tried Wood's new Closed-Back Shovel. He lifted it, felt its lightness, discovered its resiliency for himself. He grinned. "I like the heft of it!" Frank said.

Frank liked the Closed-Back Shovel, balanced and built to make hard work easier. Buyers appreciate its increased efficiency on the job, value other features:

1. *The Closed-Back Shovel combines stress-defying one-piece design, the unrivaled strength of the heat-treated shank, and an absolutely smooth back. No strap welds to pull loose.*
2. *The Turned Shoulder strengthens blade, saves shoes.*
3. *The Tapered Socket gives strength and solidity where handle joins blade, fits the hand better.*
4. *Heat-Treating makes Wood's "Moly" Big Fist, Wood and Stuart grades hard, to resist wear.*
5. *Reduced Inventory: The Closed-Backed Shovel supersedes strap weld, solid shank, and hollow-back shovels, makes it possible to cut your shovel inventory.*

NOTE WELL: Closed-Back Shovels were invented by Wood. Wood's engineers developed the special welding process which fixes the Closed-Back strip permanently without decarbonizing and weakening the blade. This is an exclusive Wood process, used on no other shovel.

Address The Wood Shovel and Tool Co., Piqua, Ohio, U.S.A.

WOOD'S
Shovels · spades · scoops
In these famous grades . . . "Moly" (Mo-lyb-den-um)
. . . "Big Fist" . . . Wood . . . Stuart . . . Piqua

Overhead Viaduct Built on Wood Piles

(Photo on page 40)

THE elimination of some bad turns and a railroad crossing on U.S. Route 90 (Florida Route 1) through Pensacola, Fla., was undertaken as an NRM project by the Florida State Road Department early in 1934.

C. G. Kershaw Contracting Co., of Birmingham, Ala., contractor for the viaduct section of the project, a structure 1,366 feet long and 50 feet wide over two streets and the bad railroad crossing, drove test piles on February 3, 1934, to determine the bearing to be expected. In spite of the test piles there was trouble later with some of the first piles breaking and brooming so that the method of driving had to be changed.

The 10-pile bents were spaced 25 feet 8 inches on centers and the piles were spaced 5 feet 6 inches on centers, throwing one pile 2 feet 9 inches off the center line of the roadway. The spacing of the bents varied only at the railroad and street crossings.

The Pile Bents

A special pile driver with a 28-foot overhang which could drive one bent ahead of the pile driving rig was constructed. The leads were 55 feet long and carried a 3,000-pound drop hammer with a 2-drum 40-hp P & H hoist mounted at the rear of the rig. The piles driven varied from 35 to 56 feet in length with an 8-inch tip and a 12-inch butt measured 3 feet from the end of the pile. At first the piles were driven with a 12-foot drop of the hammer but the breaking of four in the first five bents brought about a change to jetting with a large flow of water under little pressure. After jetting was employed the hammer was given a 3 to 4-foot drop only. The pile was started by jetting for the first 2 feet before the hammer was used. Then when the pile had only about 3 feet to go at the end, jetting was stopped entirely and the remaining 3 feet driven with about 8-foot blows. Bearing tests for a minimum of 18 tons per pile were taken from a 12-foot drop.

The creosoted piles were driven as closely to line as possible. Then when driving was completed for one bent a harness or yoke capable of holding five piles was fastened to the top of the five piles on one-half of the bent and tightened up so that the piles were drawn into line before the cut-off was made and the cap put on. This harness was made of 6 x 8-inch timber with notches for each pile. The bracing, also creosoted, was all 3 x 10-inch stock and was used single on all piles less than 18 feet above ground and double for greater lengths. The piles received a creosote treatment of 20 pounds of oil per cubic foot of timber and the bracing and caps 16 pounds per cubic foot.

The tops of the piles received two coats of hot creosote oil and one coat of hot tar pitch and then were capped with 16-gage galvanized iron sheets. The same metal was used for all tops and ends of caps. The four center piles of each bent were cut off level and the three outer piles on either side on a slope of 3½ inches the same as the crown of the roadway slab. The caps were made in three pieces of 12 x 12-inch timber. Every pile was drifted through the cap and countersunk and every brace was bolted with ¾-inch machine bolts wherever it crossed a pile. There were two bolts for each of the cap joints.

The work of lining up the piles and the bracing was remarkable on this job for the pattern of the bracing was perfect.

The Abutments

The abutments are carried on a

**Kershaw Contracting Co.
Used 2 Concrete Plants
for 1,366-Foot Overpass
In Pensacola, Fla.**

foundation of 12-inch square concrete piles. The footings were 6 feet wide by 2 feet 6 inches deep and the walls, which were about 8 feet high at the highest point, were 2 feet thick at the bottom and 1 foot wide at the top.

A 3-bag Jaeger mixer was used for mixing the abutment concrete, using two Fairbanks scales with the platforms covered with wooden plates feathered at the edges to permit the wheelbarrows to ride onto them easily. One of the scales was used for weighing the stone-filled



C. & E. M. Photo
Details of Finishing and Curing Roadway Slab. Latticed Frames Were Used to Support Canvas to Protect Fresh Concrete from Squalls

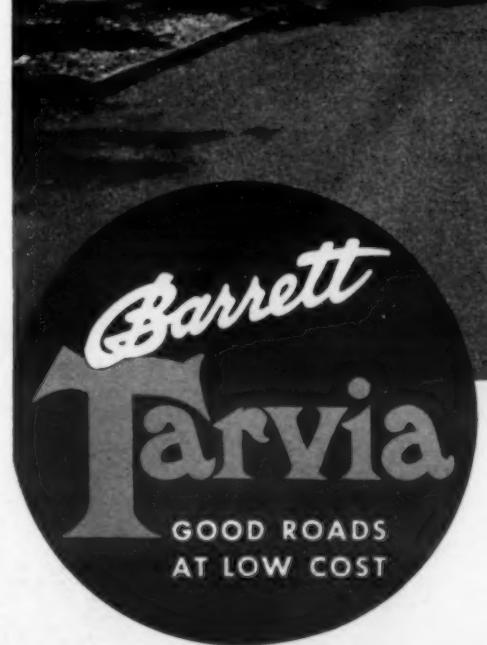
barrows and the other for the sand, eliminating the need for resetting the scales for almost every load. There were two wheelbarrows each for handling

(Continued on page 25)

Grove Street, Sewickley, Pennsylvania. Tarvia built in 1916, the year which marked the beginning of Federal Aid road building. Lower photo shows condition of road today.



1916



1935

Tarvia is made by America's oldest and most experienced manufacturer of coal-tar road-building materials. It is refined to rigid specifications which meet every road-building or road-maintaining need and fit every traffic requirement. Grove Street's nineteen years of flawless service—and this is not an exceptional Tarvia performance record—tells you how durable Tarvia roads are, and why Tarvia belongs in your road program. Phone, wire or write for details.

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Divide Sheep and Goats on Highway Relief Work

Don't Expect Real Work from Disgruntled Labor. Contracting System Better for Morale

By GEORGE C. WRIGHT
County Superintendent of Highways
Monroe County, Rochester, N.Y.

AMONG the men who appear on the work relief lists, there are extremes both as to physical ability, mental ability and experience, all the way from laborers who are qualified to do only pick and shovel work to high class artisans and office workers. We have found that the higher class employee, though he may be physically unfit for the work, usually endeavors to do a fair day's work. The opposite is generally true of men who are physically fit to perform laborious work but who, for most of their lives, have done no higher grade of work.

It seems advisable to segregate men physically fitted and mentally willing to do an honest day's work from those who are sluggards and serve only to reduce the efficiency of a gang and finally demoralize it. After segregation has been accomplished, and it is not easy, it may be possible to provide the men who are more willing to work with better circumstances or class of work to be performed. It might even be possible to give them a slight increase in pay provided the standard is not already too high, which is usually the case.

Selecting the Foremen

On such work it is even more important to select the proper type of foremen than it is on ordinary jobs, if even fair efficiency is to be secured. The foremen must be tactful, observing, and fair to the men while insisting upon a reasonable amount of work. The incentive to work may be developed by some increase in pay to those who are willing to work and cutting the pay of those who will not work. Such an arrangement must be recognized at the start as likely to cause trouble. The results must be weighed carefully before starting and a determination reached that those in control will carry it through.

One must not expect men who have done a fine grade of work and are skilled in their particular lines to become enthusiastic over a pick and shovel. They do not expect to continue in that line of work and naturally will not become interested. This must be recognized by those in charge. They must realize further that dissatisfaction among a large part of the men will never result in even average efficiency. In order to secure real efficiency these men must get back to their normal lines of work.

The loss of morale among men who have been on work relief has been noted by employers. They are not nearly as good workmen as they were before work relief was started. Unfortunately, employers do not want these men back, they are older and are less efficient than they were when they left the shop of their previous employer.

Contract Work Better

Road work lends itself in most features to the relief of unemployment and a great deal of such work has been going on. It is unfortunate, however, that taxpayers in general do not realize the expense of putting to work doing grading and base work men who have had no experience and who are not interested in the work. If this work were properly organized and done under contract

restored by activity in his usual line.

Keep Experienced Men at Work

The class of work being done in most counties under work relief demonstrates the fact that high cost for future maintenance is bound to result and early reconstruction makes the ultimate cost of this work extremely high. Capable men experienced in road work should not be laid off for the purpose of furnishing employment to inexperienced men as these men will, if this method is continued, be forced to take their places with the unemployed men who have not had their experience. They in turn will be demoralized and become

less efficient in their own occupation.
From a paper presented before the American Road Builders' Association.

Philadelphia Distributor Opens Harrisburg Branch

Service Supply Corp., Philadelphia, Pa., distributor of contractors' and road builders' equipment and supplies, has recently opened a branch at 15th and Mayflower Sts., Harrisburg, Pa.

There will be a stock of construction equipment for both sales and rental on hand and in addition, a complete stock of repair parts.



LOW FUEL COST LOWER ORIGINAL COST LOWER MAINTENANCE COST

Hopper On Semi-Trailer For Moving Bulk Cement

New equipment has been developed for handling bulk cement for the construction of the concrete pipe line for the Los Angeles Metropolitan Water District aqueduct. This Model T-222 Trailmobile special trailer has a hopper bottom which extends down through the center of the frame. The engineering department of The Trailer Company of America, Cincinnati, Ohio, has overcome the interference which normally occurs through impaired clearance of the prop mechanism by an ingenious design.

Extreme light weight is secured for the trailer and hopper-type body. The hopper has a capacity of 11 cubic yards and the chassis and body, completely equipped, weigh 8,300 pounds which permits a greater payload through elimination of dead weight.

In the top or roof of the body there are two manholes for loading. Eccentric latches seal the manholes to prevent moisture from reaching the cement. There is also a cat-walk on the top which can be used for loading out of box cars at railroad sidings where depressed loading space is provided.

A special vibrator has been developed to overcome the tendency of cement to



Semi-Trailer with Hopper-Type Body for Hauling Bulk Cement

arch when being unloaded. The vibrator breaks down the arches and does away with the need of beating the side

of the vehicle. Tie-plates have been installed which permit the removal of the hopper from the semi-trailer when not required in bulk material service so that the semi-trailer may be converted to a flat-rack type, if desired.

Hard Scale and Paint Removed by Cleaning Tool

The Model K Berg cleaning tool made by the Concrete Surfacing Machinery Co., 4559 Spring Grove Ave., Cincinnati, Ohio, has been well-known for a number of years for its ability to remove scale and paint from metallic structures. A larger tool, Model M, has been developed for removing heavy scale, thick paint and hard accumulations from steel and hard surfaces of all kinds. The new tool has four handles, thus lending it to more easy operation.

The tool consists of graded aluminum castings, a G-E motor, 15 feet of rubber lead wire with protected ends, rubber rollers to accelerate movement, a Cutler-Hammer switch, a hardened ground driving worm, a Tobin bronze worm wheel, new type felt-seal-protected ball bearings, an adjustable depth shoe to gage the cutter contacts, a steel safety guard, and various precision parts, all carefully assembled and tested.

The cutters work at 1,500 rpm driven by the $\frac{1}{2}$ -horsepower motor on either an AC or DC 110 or 220-volt circuit. The unit weighs approximately 20 pounds. The Model M carries two cutter bundles, in each of which are mounted 36 cutters which are milled from high grade tool steel and hardened. These cutters in operation contact the steel surface with a shearing action, 115,000 times per minute.

Rational Designing of Asphalt Paving Mixtures

Four papers dealing with phases of the design of asphalt paving mixtures have recently been issued by The Asphalt Institute, 801 Second Ave., New York City, in a single pamphlet. The pamphlet, "The Rational Design of Asphalt Paving Mixtures" may be secured by engineers and contractors direct from the Institute. The papers are, "The Principles of Design for Street Asphalt Paving Mixtures" covering the practice controlling stability and durability and a method of evaluating such mixtures; "Stability and Related Tests for Asphalt Paving Mixtures" describing the Hubbard-Field Stability Test as applied to laboratory prepared specimens and core specimens taken from completed jobs and gives methods for determining voids in the compressed mixtures and in the compressed mineral aggregate; "Application of Test Results to Asphalt Paving Mixtures," describing the utility of the stability test for evaluating the various constituents of asphalt paving mixtures, as well as combinations of these constituents, illustrated by typical graphs; and "Adaptation of the Stability Test to Include Coarse Aggregate Asphalt Paving Mixtures," describing a method by which the stability of coarse aggregate mixtures may be evaluated in the same comparative unit as fine aggregate mixtures, for which the Stability Test was originally designed.

FACTS

ABOUT ECONOMICAL TRACTOR OPERATION

WHEN it comes to tractor costs, there is just one figure to consider—one figure that means the difference between profit and loss—FINAL COST. Low fuel costs are fine . . . but sad is the story when repair costs are forgotten . . . or when no allowance is made for condition of the tractor when the job is done.

A-C Oil tractors do the work at Lowest Final Cost because they do not stop with low fuel costs. They burn low cost fuel and little of it. Their first cost is lower because horsepower and weight are properly balanced through improved design. Maintenance is lower because internal pressures are less than one-third those of the compression type. Depreciation is less because A-C Oil Tractors can "take it" . . . as demonstrated on tough jobs throughout the country.

When it comes to performance . . . A-C Oil Tractors consistently make more trips . . . do more work . . . at lower cost . . . than any other tractors built. Users who want FACTS are demonstrating this every day by actually comparing costs before they buy.

MODEL "L-O" . . . 76 DRAWBAR HORSEPOWER
MODEL "K-O" . . . 48 DRAWBAR HORSEPOWER

MENANCE LESS DEPRECIATION LOWEST FINAL COST

Getting the facts* McCormick Lumber bought five Model "L-O" Tractors. This at Camp Union, Washington, is doing work at LOWEST FINAL COST.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Lubrication Queries

Is some lubrication problem bothering you? Tell us about it and we shall be glad to help you.

Question

What lubricant should we use to secure best results with open gears?—Baton Rouge, La.

Answer

Gear lubrication is in some respects more difficult than bearing lubrication. The concentration of load on very small tooth areas results in extremely high unit pressures without any mechanical forces which would tend to maintain the lubrication film, as is found in a revolving bearing. It is essential to use a grease rich in suspended soft solid or plastic substances, such as pure electric-furnace graphite, which will cushion the contact surfaces of the teeth with a film of lubrication and which will adhere firmly either in motion or at rest. For this surface use a fluid grease, which has a soft, spongy, clinging nature, a very low coefficient of friction and which will leave a thick coating on every tooth no matter how long the gears are idle.

For spiral or open gears subject to heat or high centrifugal action, or on heavy, slow moving chains and open worm gears, a very adhesive, yet plastic, soft solid gear grease should be used. For power shovel gears or other gears where dusty or dirty conditions prevail, a very heavy and sticky grease which will prevent damage from gritty dust and dirt is necessary.

Where the equipment is exposed to outdoor conditions, lubricating greases containing pure electric-furnace graphite are particularly suitable. Whether applied to the lubrication of cables, chains, gears or revolving bearings, the graphite improves the contacting surfaces with use. It gradually works into these surfaces equalizing microscopic irregularities. Its high affinity for grease and oil preserves a film of fluid lubricant under the most severe operating conditions or over prolonged periods or shut-down. Each particular part requires special consideration as to the grade of lubricant to be used. This is a matter which is essential to the long life and permanent utility of the part.

Question

Is it necessary to keep the crankcase of the gas engine on our tractor always filled with oil? The machine is operated on very rough work and we believe we lose a lot of oil by splashing if the crankcase is kept more than half full.—Denver, Colo.

Answer

Your question is probably answered most effectively by quoting from a letter

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including Bridge deck slabs, Dams and Locks, Highway pavement and Concrete products.

Write for circulars and engineering data.

MUNSELL CONCRETE VIBRATORS

997 West Side Ave., Jersey City, N. J.

only recently received from a Portland, Ore., distributor who states,

"A constant source of trouble is the failure to keep a sufficient amount of oil in the crankcase of an internal combustion engine. As a glaring example, we recently had a gasoline engine which had been on a rental job come into our warehouse. The total content of the crankcase did not exceed one quart and the stuff that was in there was of the consistency approximately of 600-W. How the engine escaped without ruined pistons and cylinders we are unable to say, but with such a condition and perhaps low water in the radiator, there is hardly a chance for an engine to get by."

There is little chance for oil in your crankcase to "splash" out of the crankcase except through the breather and the loss even in the roughest going through the breather is negligible when compared with the possible damage to your engine through an inadequate amount of high-grade crankcase oil of proper consistency.

New Equipment Distributor in Dallas, Texas

Texas Equipment & Supply Co., Dallas, Texas, opened its office and warehouse at 325 S. Second Avenue on April 1. This new company, organized to handle grading, concreting and road building equipment, will also carry wall and wire ties, electric saw rigs, metal lathes, lighting plants, welding outfits and steels, asphalt plants, air compressors, mixers, pavers, cranes, shovels and similar equipment.

N. C. Highway Commission Buys 25 Adams Graders

The North Carolina State Highway and Public Works Commission recently purchased twenty-five Adams No. 72 leaning-wheel graders from E. F. Craven Co., "The Road Machinery Men" of Greensboro, N. C., to help build and maintain highways throughout the State.

The Commission, which has used many Adams machines in the past, has still in use Adams graders which date back 10 and 15 years, and the field men say that they are still going good.

Fifteen of the new machines were shipped to Division A, five going to Tarboro, five to Washington and five to Rodo; five in Division B were shipped to Fayetteville; and five in Division C to Greensboro.

COMPLETE CUTTING AND WELDING APPARATUS

for all types of light and heavy work. Torches, tips regulators, hose, goggles, gloves, lighters and wrenches. Low prices—highest quality materials and workmanship.

Write for catalog

The Alexander Milburn Co.
1409 W. Baltimore St. Baltimore, Md.

Moving America's Loads

HERCULES POWER

Hercules designs and builds more multi-cylinder, heavy-duty power plants than any other manufacturer producing only internal combustion engines. And every year many thousands of Hercules Engines—both gasoline and Diesel—become motive power for the great trucks and buses which move the heaviest loads of freight and passengers on the highways of the world.

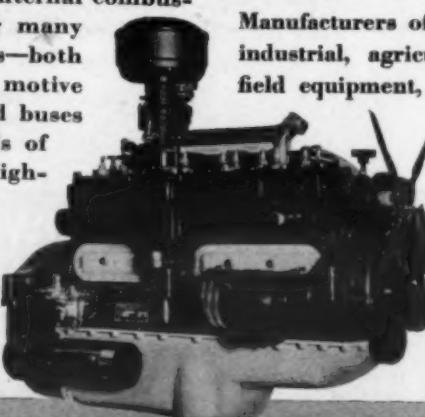
Hercules Engines have won their place as standard equipment on famous makes of heavy-duty trucks and urban and

interurban buses by drastic competitive tests and millions of miles of efficient, economical operation.*

Manufacturers of all types of powered machinery, industrial, agricultural, road building and oil field equipment, turn to Hercules for specialized

engineering experience in the designing and building of heavy-duty power plants to meet their varied needs.

*The names of the many leading truck and bus manufacturers who standardize on Hercules Engines will be supplied upon request.



HERCULES ENGINES

HERCULES MOTORS CORPORATION, CANTON, OHIO
America's Foremost Engine Manufacturer • Power Plants from 4 to 200 H. P.

Casting and Driving 936 Concrete Piles

(Continued from page 2)

batches a full 2 minutes which probably accounts for some of the strength secured in the piles. Incor cement also was used to speed the operation. The average batches for the mixer consisted of 2,544 pounds of sand, 3,662 pounds of gravel and 12 bags of Incor cement with 6 gallons of water per bag of cement. The concrete was delivered to a 2-yard side-dump bucket of local manufacture, having a hand-controlled guillotine gate.

A 25-ton gantry crane with a 70-foot span ran the full length of the casting yard and to the mixing plant. Batches were delivered from the mixer to the 2-yard buckets through a chute controlled by a hoist which raised the chute clear of the gantry. The buckets were picked up one at a time by the gantry and carried to the proper bay where casting was in progress. The concreting crew spaded, rough graded and finished the pile by hand and it was immediately covered with burlap and sprinkling began. There was one man for hand sprinkling in each bay and several rotating lawn sprinklers which kept the piles damp for the full 10 days of curing.

The Pile Bents

In order to predetermine the condition of the ground for the full length of the job, the contract provided for driving and loading about 48 piles along the center line of the bridge for test purposes. Each of these was loaded to failure with loads up to 150 tons of precast concrete weights which fitted over the pile and were placed by cranes from flat cars. After the test had been satisfactorily completed the weights were removed and the test piles broken at ground level and the reinforcing burned off to remove the obstruction.

The 6-pile bents, of which there were 156 for the length of the bridge, were spaced 38 feet 9 inches on centers with the three piles on either side of the center line spaced as follows from the center line: 3 feet 9 inches, 10 feet 6 inches and 19 feet.

The cured piles ready for driving were picked up by tongs at three points by the gantry and carried to the end of the yard where a specially constructed pile car with a turntable cradle mounted on it was drawn up. The pile was placed on the cradle and fastened ready for hauling out to the site for driving. The haul was minimized by the location of the casting yard at approximately the center of the contract. Hauling was done by a Plymouth locomotive.

Driving the Piles

Well ahead of driving, the contractor had holes about 3 feet square and 2½ feet deep dug by hand at the location of each pile. This proved a very satisfactory method of exploring the site and on several occasions uncovered stumps

which would have spoiled the excellent record for straight driving of the piles throughout the job.

The pile driving rig mounted on I-beam skids carried a 60-hp American Hoist & Derrick Co. steam boiler and a 5-drum hoisting and swinging engine. The leads were 105 feet long and the driving was done with a Vulcan No. 0, 17,500-pound steam hammer. The entire driving rig was mounted on a turntable and the handling of the piles from the cradle on the pile car to the position in the leads for driving was only a matter of a few minutes.

The piles were spotted in place and driven through a steel welded yoke which was another contribution to the speed of the operations. The contractor had planned on driving about eight piles a day but found no difficulty in handling from fourteen to eighteen a day. Before driving started two instrument men of the highway department staff sighted on the pile and continued until it was driven to the proper depth.

After the piles were driven the driving head was knocked off and the steel turned for binding the pile into the concrete cap.

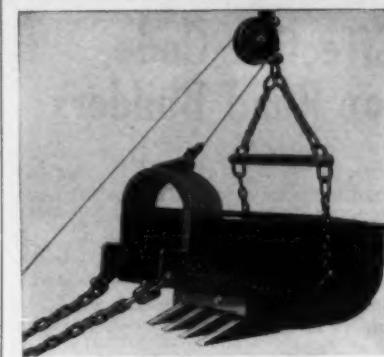
Two or three mats of Celotex about 1 inch thick were placed over the head of the pile before driving to take up any

(Continued on page 28)

All-Welded Bucket Is Light But Strong

Designed to reduce excess weight to a minimum and at the same time provide great strength through all-welded construction, a new light-weight bucket was recently announced by the Harnischfeger Corp., Milwaukee, Wis., as a general purpose unit for high production work.

The bottom, sides and back of this new P & H bucket are formed by a single heavy steel plate securely seamed at the back and with a heavy angle reinforcement mounted around the entire



The New P & H All-Welded Bucket

upper edge for additional rigidity. Four forged wearing shoes or runners are welded to the bottom to take the wear from the bucket shell.

The arc and side reinforcements are fabricated as a single unit with the lip plate, the latter being 2 inches thick and capable of taking the punishment of a much heavier bucket.

ON THE JOB—IT'S A SHOW-DOWN

Moving big loads over any kind of footing—at record low costs—that's where the "Caterpillar" Diesel Tractor shows the stuff it's made of. Have your dealer give you the performance figures on the thousands of "Caterpillar" Diesels—engines and tractors—now building profits for power users all over the country. Test it in action on an operation of your own. For low costs, sure power, easy handling, convenient service—the "Caterpillar" Diesel wins in a SHOW-DOWN. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

Earth-moving costs have hit new lows on the Mississippi Levee since "Caterpillar" Diesel Tractors have been on the job. This one, at Elmo, Arkansas, is hauling from a dragline at a fuel cost of 15 cents an hour.



A fact worth considering:

We guarantee our customers a larger production at both a lower first cost and a lower operating cost.

Let us send you our catalog.

**THE MILES MFG. COMPANY
JACKSON, MICH.**

Effective Code for Road Builders

(Continued from page 5)

on some items. These are what make the estimate sheet so essential in code enforcement. The estimate sheet is not only an enforcement factor but an educational factor, as it is educating lax bidders to study their costs and bid on all of them.

Many lessons have been learned in operating the state code. There has been much of trial and error. The code is now being revised by inserting a provision that not only shall an award be refused a contractor if he has violated the code but also that he be disqualified for a certain period.

The State and National Codes

So far as the national code is concerned, the Wisconsin contractors are not aware of the existence of the national code except that they are assessed for its support. It is felt that there should be a national code for the highway industry, separate from other construction groups; that the national code should have broad delegated powers like those of the Federal government but that all other powers should be reserved to the states and that enforcement should be local. National enforcement is not workable, in our judgment.

The cost of operating the Wisconsin code is borne by an assessment of one-half of one per cent of the award price on the contractor.

The Teeth of the Wisconsin Code

Wisconsin statutes provide for criminal penalties and restraining orders to protect the code. The Code Administrator requires the Highway Department to refuse to award a contract to a contractor

who is not complying with the code. Violation of the code is a violation of state law and the Highway Department, as a coordinated State body, must take cognizance of this fact. In any state code act there should be a clause making it mandatory on the highway department to refuse to award a contract to anyone whom a State Code Authority has cited as a violator of a code.

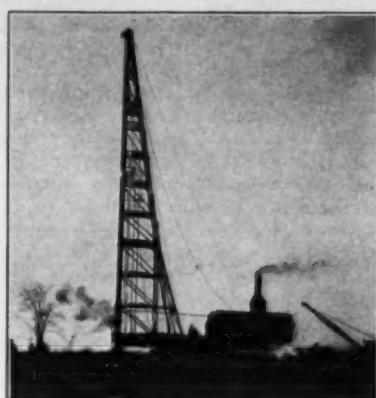
New Goose-Neck Trailer of Heavy-Duty Design

A heavier goose neck features the new LaCrosse Tu-Way trailer distributed by C. R. Jahn Co., 760 Polk St., Chicago, Ill. The beam which forms the goose neck runs clear through from the rear end to the front. The goose neck is made by taking a triangular piece out of the web and welding it back together again after bending. Thus, the beam is never cut through but retains its original strength.

The trailer is equipped with either pneumatic or solid tires, has brakes on all four rear wheels, mechanically, vacuum or air-controlled. When mounted on pneumatic tires, the new heavy-duty small diameter Goodyear tire is used. This tire is less than 30 inches in diameter which lowers the platform height more than the usual conventional design.

Dirt-Moving on the Levees

Charles Weaver & Co., Inc., of Anoka, Minn., working on the A. Guthrie & Co.'s job at Renalara, Miss., is loading 6,000 yards of dirt per 24-hour day with a Cletrac 80 and an Austin-Western 48-inch motor-driven elevating grader. This grader, which is equipped with a 32-inch disc, is plowing deeper than 24 inches and loads two 7 to 8-yard wagons a minute. The unit consumes 6½ gallons of gasoline per hour.



Work Starts on the Reconstruction of Ford Exposition Building

Foundation Piles Driven for Ford Building

A giant pile driver has begun the driving of 644 composite piles down to bedrock to form the foundation for the huge gear-shaped rotunda of the Ford

Building of the Century of Progress Exposition which is to be reconstructed at the Rouge Plant of the Ford Motor Co. at Dearborn, Mich.

The pile driver, with 100-foot leads and an 8-ton steam hammer, is driving the 90-foot piles to bedrock. An additional 10 feet of concrete will be poured in a steel shell above the pilings to make a solid foundation for the huge building, which will be 110 feet high, 210 feet in diameter, with two wings, each 100 feet long, extending from the rotunda.

When completed, the center of the rotunda will house an open court in which the Ford World, a globe 20 feet in diameter, will revolve. On the walls will be photographic murals depicting scenes at Rouge Plant, while the two wings will house a theater, a display of Ford products, and many educational exhibits. Around the building there will be a 13.5-acre landscaped park, through which will run an expanded series of the "Roads of the World," one of the highlights of the Ford exhibition in Chicago.

Show me
THE NEW REX 10-SPEED "E" WITH END DISCHARGE
IT'S READY . . . BE READY WITH IT . . .
to Meet Modern Job Conditions and Prices

A Bridge Builder's Special

Here it is—a new Rex—built on the Rex High Speed, lightweight principle... with all those original Rex features that made the Rex 10-Speed "S" the model of the industry.

Those original Rex Features—

- ★ 7-second Shimmy Skip
- ★ 7-second Discharge
- ★ Pressed Steel Drum
- ★ Pressed Steel Timken Drum Rollers
- ★ Governor Booster
- ★ Unit Power
- ★ Group Controls
- ★ Roller Bearing Wheels
- ★ Automotive Steering for Fast Towing
- ★ Proper Balance
- ★ Rex-O-Meter

And where else do you get them all, plus vertical water tank—four wheels for fast, safe towing, three-point suspension, short wheelbase—and discharge—quick maneuvering up to any discharge point—as light or lighter than any 10-S or 10-E on the market?

You will want to know more about this

new Rex. It is modern, with it you can get lower costs on any job that calls for a 2-yard mixer. Send for the book, "Speed—Speed—Speed with Rex High-Speed Mixers." Use coupon.

Chain Belt Company,
1600 W. Bruce St., Milwaukee, Wis.
Home Office—Central and Northwest
Eastern Division: 322 Chrysler
Bldg., Newark, N. J.
Southern Division: 2704 Lexington
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West Coast Division: 100 Harrison
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CHAIN BELT COMPANY
1600 W. Bruce St., Milwaukee, Wis.
Please send me the Catalog "Speed—
Speed—Speed with Rex High-Speed Mixers."

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REX CONSTRUCTION EQUIPMENT

PROVE IT HERE

GET THE TIME-SAVING, MONEY-SAVING FACTS about the Gardner-Denver "5" SERIES SINKERS Right on Your Own Job

OTHER "5" SERIES MODELS

S-55 Sinker—the most popular 55-pound sinker on the market

S-35 Sinker—the preferred drill for block-holding (weighs only 28 pounds)

"5" SERIES FEATURES

- Now there are three of them—three of the famous Gardner-Denver "5" Series Sinkers that definitely prove their superiority by increasing your daily footage ... shortening your overall drilling time ... and cutting your maintenance costs.
- For greater drilling capacity—unusually low air consumption
- Powerful blowing device assures clean holes always
- Rugged construction assures utmost dependability
- Easier riding—due to perfectly synchronized valve action

GARDNER-DENVER COMPANY
102 Williamson Street
Quincy, Illinois

GARDNER-DENVER
MAKES AIR DO MORE AND COST LESS

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Class A	Gravel
Class B	Gravel
Class C	Cement
Class D	Water
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Class F	Cement
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Class H	Gravel
Class I	Cement
Class J	Water

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Overhead Viaduct on Wood Piles

(Continued from page 19)

The concrete was mixed 1½ minutes and a 4½-inch slump was obtained rather uniformly. The forms were made of 2 x 6-inch lumber, using the same material for wales and braces.

For the various classes of concrete used on this work the dry rodded weights of aggregates used were as follows:

Class A concrete for substructure and structure	594 pounds
Sand	594 pounds
Gravel	963 pounds
Cement	3 bags
Water	18.6 gallons
Class C concrete for hand rail	
Sand	360 pounds
Gravel	594 pounds
Cement	2 bags
Water	11.2 gallons
Class AA concrete for piles (foundations)	
Sand	474 pounds
Gravel	822 pounds
Cement	3 bags
Water	16.2 gallons

Steel Structure

The steel superstructure included 1 beam stringers throughout. The stringers on the outside for the standard span and which carried the sidewalk were 16 inches deep with a wide flange and weighed 37 pounds per foot. The inside stringers were 22 inches deep and weighed 62 pounds per foot. On the 55-foot span over the railroad the sidewalk beams were 28 inches deep and weighed 97 pounds per foot, and the inside beams 33 inches deep and 141 pounds per foot. On the 43-foot span over the street the sidewalk beams were 24 inches deep and weighed 70 pounds per foot, and the inside beams were 30 inches deep and 108 pounds per foot. There were two sidewalk and eight inner beams for each bent.

The beams were all placed with a 25-foot A-frame derrick operated by a 2-cylinder LeRoi engine. The large beams across the railroad were lifted with a rented Koehring crane. The work was finished within an hour and the actual setting was done with jacks.

Concreting the Railroad Span

The concreting plant for the railroad span was set at ground level and the concrete raised to the overhead span by a tower rig. The aggregates were segregated in bins and two men at each section shoveled to the two Johnson bantam batchers. As soon as the weight was correct as shown on the scale two men for each batcher wheeled the material in wheelbarrows to the skip of the Jaeger 3-bag mixer. The mix was timed for 1½-minutes. In front of the mixer an Insley 60-foot steel tower carrying a ¼-yard bucket raised by a Novo 40-hp hoist was set up. The size of the bucket made it necessary to run the bucket up the mast twice for each batch of the mixer. This was handled by a receiving hopper at the bottom as well as the hopper at the top of the mast for delivering the concrete to the wheelers.

In addition to the men handling aggregates mentioned above, there was a man dumping the three bags of cement into the mixer skip and also hitting the skip when it was up to insure delivery of the entire batch to the drum, the mixer operator, the hoist operator, one man at the top of the mast, one on the chute to the buggies and three to five men wheeling the buggies, depending on the distance.

The top deck was poured in three sections; first the 40-foot roadway and then one and the other of the 5-foot sidewalks. The concrete crew on the deck consisted of three spaders, two men puddling, and two finishers who, assisted by others, used a heavy steel screed, then a belt and finally a straight-edge and hand floating. The steel screed was 28 feet long with a 3-inch channel on the bottom strengthened with other angles inserted and with two angles back to back to form a truss connected

with rods and nuts to adjust the screed.

The steel stringers or beams spanned two bents so that an expansion joint was inserted at alternate bents where the beams broke, with a construction joint between slabs of intermediate bents. In pouring the deck the engineers found that there was a maximum settlement over the caps or bents of ½-inch and a deflection of only 1½-inch at mid length of the 25-foot 8-inch spans.

The forms for the handrail were made up in panels of the proper lengths to pour the rail from one post to the next as a unit and were built of long leaf yellow pine. The camber of the bridge was taken care of by wedges of different sizes inserted at the ends of the rail forms when they were set up for each pouring. The inside and outside forms were identical.

Quantities

Item	Amount	Unit Price
Clearing and grubbing.....	.142 acres.	\$100.00
Concrete handrail.....	2,461 linear feet.	2.40
Treated structural timber.....	59 M.F.B.M.	115.00
Treated timber piling.....	17,550 linear feet.	1.05
12-foot square concrete foundation piling.....	3,328 linear feet.	3.00

Class A concrete superstructure... 1,443 cubic yards. 19.65
Class A substructure concrete... 162 cubic yards. 19.65
Class A concrete retaining wall... 384 cu. yds. 19.65
Net length of project..... 1,250.37 feet
Net length of bridge..... 972.54 feet

Personnel

This railroad overpass project was started by the contractor, C. G. Kershaw Contracting Co., of Birmingham, Ala., in February, 1934, and completed before the end of October, 1934. H. J. Wilson was the Superintendent in charge of construction for the contractor and J. P. Jennings was Project Engineer for the State Road Department of Florida.

New Littleford Manager for New York Office

Hub F. Reynolds, who has been associated with Littleford Bros. for the past nine years, has been appointed Manager of the Littleford New York Office. Mr. Reynolds, who has spent four of his nine years in the Road Equipment Division and is experienced in both road equipment and steel fabricating, moved

into his new quarters at 10 E. 43rd St., New York City, last month.

Check your equipment often and keep ample repair parts on hand to repair properly or replace worn or defective parts. Make it a rule to have the hand tools of each gang inspected daily before using.



New F-25
Handles 4 cu. ft.
wet concrete

LANSING Contractors' Barrow
... with Pneumatic Rubber Tire
and Roller Bearing

LANSING COMPANY
LANSING, MICHIGAN

Chicago New York Minneapolis Boston
Philadelphia San Francisco Kansas City

What fuels DOES THE HESSELMAN BURN?



Fuel test of 100-Hp. Waukesha-Hesselman Industrial Engine in one of the Waukesha dynamometer rooms

Standard Waukesha-Hesselman Engines are built to operate on practically all clean, refined commercial fuels regardless of cetane number.

Fuels that are satisfactory in solid injection Diesel engines of equivalent speed range give equal satisfaction in the Hesselman. While the Hesselman and the high-speed Diesel are alike in this respect, the Hesselman operates smoothly and efficiently on many fuels that would be rough and detrimental to a compression ignition engine.

Fuels with a high carbon, gum or sulphur content, and those too heavy to flow readily at surrounding operation temperatures, or too light to lubricate the injection system, should be avoided.

Lighter oils which lack inherent lubricating properties may be utilized in the Hesselman after this deficiency is made up by mixing a very small amount of engine lubricating oil with the fuel. Thus standard furnace oils, Nos. 1, 2 and 3, kerosenes and distillates, as well as commercial high-speed Diesel fuels, are available for use with Hesselman engines.

The practical significance of this is that suitable fuels may be found wherever high-speed Diesels are in use, and in many odd corners of the earth where only kerosenes or distillates are available.

Write for Bulletin 1000. Waukesha Motor Company, Waukesha, Wisconsin.

THIS IS NO. 3 OF A SERIES on the Hesselman Oil Engine. No. 4 will appear next month. A reprint of the complete series will be mailed on request.

WAUKESHA ENGINES *

Highway Program in Wyoming

The construction of the highways of Wyoming has been carried on at the expense of approximately 5 per cent for administration and surveys and an additional 5 per cent for construction engineering. These figures compare favorably with similar costs in states adjacent to Wyoming, as well as with the State of California which spends approximately ten times as much on highways as does Wyoming.

During the past year there was an average of 2,100 men continuously employed in the construction and maintenance of Wyoming highways. The exact mileage of each type of highway complete or under contract as of February 1, 1935, is as follows:

Type	Miles	Per Cent
Oil or Pavement	2,233	65
Gravel	830	24
Earth	384	11
TOTAL	3,447	100

All but about 50 miles of the state highways listed are maintained by the State Highway Department. The cost of this maintenance has been held down to \$200 to \$250 per mile per year which includes the expense of snow removal, flood damage, maintenance of signs, repair to bridges and culverts as well as the maintenance of a smooth-riding surface. Maintenance figures per mile in Wyoming, when compared with figures from other states, show that the roads are maintained at a cost of from \$40 to \$100 less, according to the Wyoming Highway Bulletin, than the roads in other states which have similar conditions. With this maintenance expenditure per mile, there is no depreciation on an oiled road. This can be maintained in its original condition.

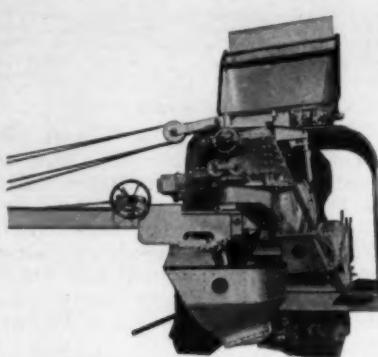
Except for funds furnished by the Federal Government, the expense of construction and maintenance of the highways is paid by approximately 10,000 trucks with a capacity of 1½ tons or less; 3,200 trucks with a capacity over 1½ tons and 52,000 passenger cars. In addition to these funds, revenue is derived from tourists and through-traffic not registered in Wyoming, estimated at 25 per cent of the total.

New 27-E Pours 39 Batches An Hour on 1¼-Minute Mix

In its twenty-fourth year of manufacturing Ransome pavers, the Ransome Concrete Machinery Co., Dunellen, N.J., announces a new 27-E model, known as Model S, which retains some of the features of previous models but which is also improved and simplified in several ways. It is claimed that this paver has maintained an hourly average of approximately 39 batches per hour for eleven hours continuous operation on a 1¼-minute mix.

Greater horsepower, a longer boom, auxiliary water tank, larger pipes from tanks to drum, simplified countershaft construction, larger clutches and trouble-proof crawler construction are among the features of this new model.

The power loader is streamline in design, with no pockets to catch cement. The plunger-type water tank is designed to give accurate water control under all conditions. The drum and drum rollers are of all-steel construction, with the blades lined with high-carbon steel. The rollers are of car wheel metal with large Timken bearings in each roller and the roller shafts are adjustable to keep the drum riding on all rollers and properly centered. The discharge chute is a semi-circular two-piece unit, completely out of the drum during the mixing period, with a discharge time of 8 to 10 seconds. The boom is 25 feet 9 inches long, giving 22 feet 6 inches of bucket travel. The rigid-type crawlers are ele-



The New Ransome 27-E Paver

vated at both ends for climbing over uneven surfaces.

Power is furnished by a 6-cylinder Buda engine, developing 75 hp at 1,200 rpm, with Twin Disc clutch and gear reduction unit. It has radiator cooling, a Zenith carburetor, Scintilla magneto, fuel pump, air cleaner and the rear reduction unit is enclosed and runs in oil.

W. A. Hauck Joins Lukens as Assistant to President

Lukens Steel Co., Coatesville, Pa., has announced the appointment of W. A. Hauck as Assistant to the President. Mr. Hauck was formerly associated with George W. Goethals, Inc., in company management and engineering work, and recently with the American Iron and Steel Institute where he was engaged in work in connection with the Code of the Iron and Steel Industry.

Men exposed to the hazards of working over water on the pier construction of the Golden Gate Bridge were equipped with life preserver vests. One night a heavy ground swell swept one of the workers off a low platform. A swift outgoing tide carried him toward the open sea (he started 1,000 feet from shore). Twenty minutes later, a rescue tug caught up with him and found him floating high. Had he neglected to wear the preserver!

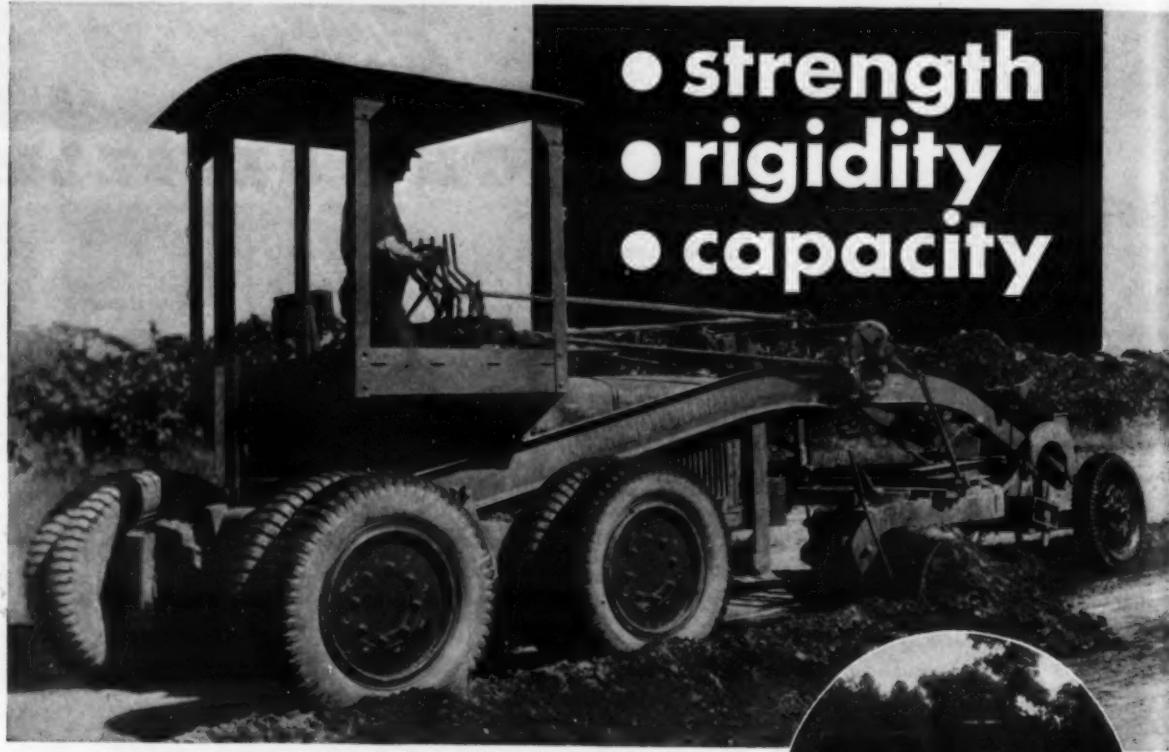


DETROIT MOTOR SCYTHE

- Here is the most economical and easily handled cutter on the market!
- It goes anywhere, cuts anything, and enables one man to do the work of four or more with hand scythes.
- It has a 36-inch sickle driven by a powerful one-cylinder gasoline motor and is mounted on a free running 30-inch wheel, allowing it to be backed up, pivoted sharply, or tilted up or down slopes similar to a wheelbarrow.
- It is now produced by a recognized leader among mower manufacturers and during over four years of service, thousands of users have enthusiastically testified to its dependability.

Write for prices and Bulletin No. 3

DETROIT HARVESTER CO.
5450 W. JEFFERSON AVE., DETROIT, MICH.



Adams Motor Grader—8-wheel Tandem Drive—mixing oil and sand.



Adams Motor Grader—4-wheel Tandem Drive—reditching a gravel road.



Adams Motor Grader—2-wheel Drive—reshaping a dirt road.

Whether it's an oil-mix job—a ditching job—or the reshaping and maintenance of earth, gravel or stone roads, Adams Motor Graders have the strength, rigidity and capacity to do the work to your complete satisfaction.

The Adams frame—a strong, solidly-welded unit of distinctive design—provides unsurpassed strength and rigidity for smooth cutting. Adams machine-finished construction, with adjustability for wear, assures smooth operation and long life.

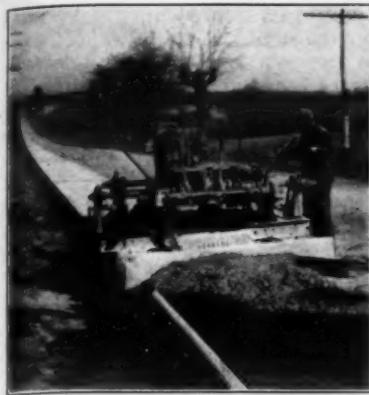
In soft or uncertain "going" you can depend upon Adams Tandem Drive (4 or 8 drive wheels) to take you through. The drive wheels grip the ground at four points five to six feet apart. Each wheel is independently driven; each helps to pull the others over soft or slippery spots. Adams Motor Graders are also available with dual-tired, two-wheel drive. They are powered by McCormick-Deering or Case tractors and are furnished with hand con-

trols or Adams positive-acting power-operated controls. Write for catalog completely describing the mechanical and operating advantages of these machines.



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INDIANAPOLIS, INDIANA
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ADAMS MOTOR GRADERS



A 4-Foot Flex-Plane—the Smallest Finishing Machine Ever Constructed

Smallest Finishing Machine

A 4-foot Flex-Plane finishing machine, the smallest finishing machine ever constructed, was used to screed concrete forward and backward on the S. Monroe & Son Co., 18,484-foot concrete job at Lexington, Ohio recently. The machine also installed a poured transverse contraction joint every 30 feet. The track wheels on one side of the machine ran on the steel road forms; on the other side flat face track wheels were used to run on the old concrete pavement in place.

The job was in charge of Hayden Miller, Superintendent for the contractor, with Robert Hancock and Stanley Horn, Engineers for the project.

Maximum Space for Payload in New Short-Length Truck

A new short-length truck, designed for use where turning and parking space is of particular importance, has recently been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. This model, known technically as Model X6 Special, and designated by seasoned operators as "the Camel Back," is so designed that a very large proportion of its total length is available for payload.

The cab is set over the engine to give maximum space, and the truck is so constructed that there can be even distribution of load weight. The front axle is set back 4½ inches from the line of the front bumper to secure safety as well as maneuverability. It is equipped with six wheels and three axles and power is applied, in equal amounts, on the front axle of the truck and the front axle of the bogey. Braking force is exerted equally on all six wheels and an emergency brake drum on the transmission gives assurance of complete control. Power is furnished by a 125-hp engine at 2,500 rpm. Gasoline is fed from a 50-gallon tank mounted on the running board, the gas being forced to the carburetor by a pump.

Any type of body desired may be secured for this model, including tank bodies, racks, platform, stake bodies and utility bodies.



Resharpen Your Rock Bits

with a Quick-Way Bit Grinder.
Resharpen them again and again at a cost of from 2c to 4c per bit.

C. H. CARLSON MFG. CO.
13-15 Main St. N. E. Minneapolis, Minn.

Cost of Tractors in Grading

The Pima Indian Reservation near Sacaton, Ariz., boasts one of the world's largest tractor fleets, thirty-six machines, most of them powered with diesel engines. Fifteen of the 50-hp diesel tractors recently completed a five-month test during which they showed an average fuel cost of less than 10 cents an hour.

The tractors were leveling land, thirteen of them pulling 10-foot scrapers and the other two pulling 12-foot graders. Field conditions on the Reservation were very dusty and temperatures ranged from 70 to a maximum of 116 degrees.

The following table tells the complete story of the results of these tractor tests:

Number of tractors, 15.
Type—Caterpillar Diesel Fifty.
Total hours worked during test, 17,191.2.
Average fuel consumption per hour, 2.48 gals.
Total fuel consumption, 43,494 gals.
Fuel cost per gallon, \$0.04.
Total fuel cost, \$1,699.76.
Average fuel cost per hour, \$0.099.
Average fuel cost per 10-hour day, \$0.99.

New Diesel Compressor in Five Sizes

One of the most recent developments of Schramm, Inc., West Chester, Pa., is a two-stage compressor powered by a Caterpillar diesel engine, providing the

efficiency of two staging plus the economy of diesel engine operation.

This new Schramm compressor is of the vertical water-cooled design and a simplified flow of air. These compressors are available in five sizes and can be secured with any type of portable compressor mounting.

Good Roads CHAMPION SPREADERS

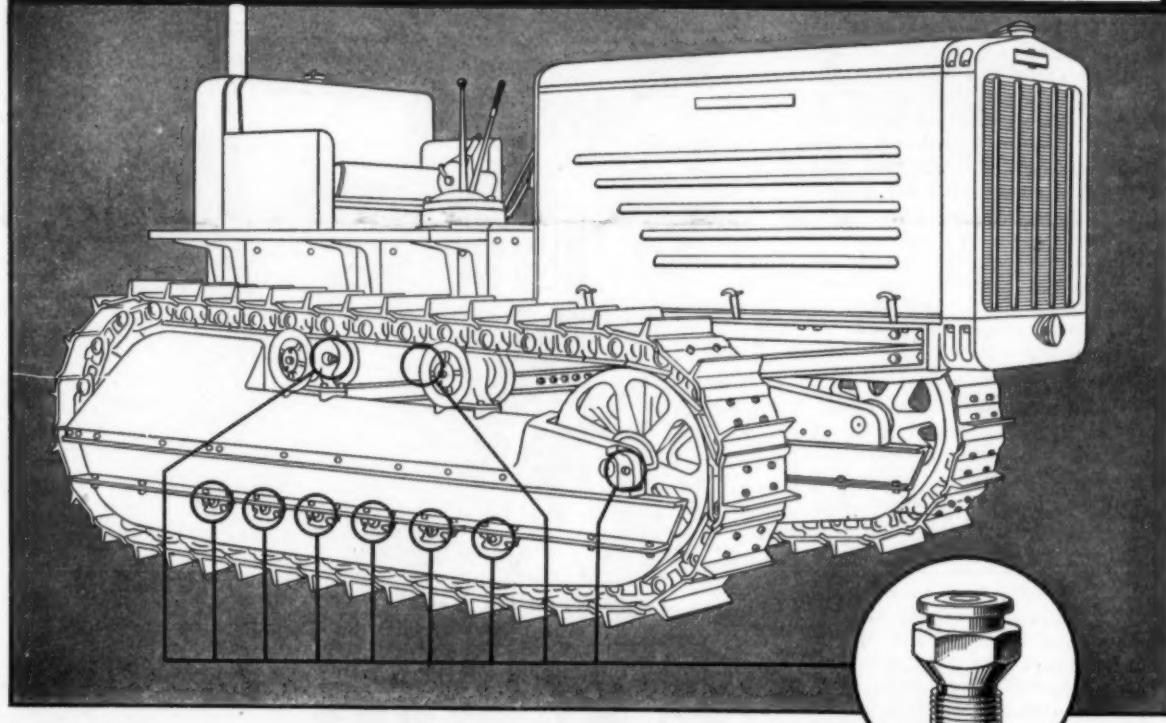
for
Stone Chips—Cinders—Sand
Heating Kettles
The "Autograder"
Drawn Graders—Road Drags
Champion & Climax
Rock Crushing Equipment



GOOD ROADS MACHINERY CORPORATION
KENNETT SQUARE PENNSYLVANIA

WITH ALEMITE ON TRACK ROLL BEARINGS

YOU CAN — Slash Repair Bills
— Reduce Lubricant Costs
— Cut Lubricating Time 90%



NOW, by the simple replacement of antiquated, hard-to-service "pipe plugs" with modern, efficient Alemite Giant Buttonhead Fittings, you can make amazing operating savings on all crawler-type equipment—tractors, trailers, dump wagons. In actual time savings alone, hundreds of contractors have found that this modern system quickly repays its small cost. Think of it! With this system every vital track roll bearing on a tractor can be completely lubricated in 5 minutes—where, with old methods, it requires 45 minutes!

And with Alemite there is no loss of lubricant and you're sure the job is done right.

All major manufacturers of crawler-type tractors—Allis-Chalmers, International Harvester and Caterpillar—important makers of crawler trailers and dump wagons—now supply the Alemite Buttonhead system on new equipment. They know it's economical, positive, and that it saves labor.

Alemite Buttonhead Fittings are made of specially hardened steel—come in all thread sizes. They're easy to install and easy to service—insure delivery of clean lubricant—eliminate expensive bearing repairs. And the cost is extremely low.

Your equipment jobber will gladly explain how you can make important savings with Alemite. Ask him about it today. Or write direct. Address a note on your letter-head to:

ALEMITE CORPORATION

(Div. of Stewart-Warner Corp'n.)

1850 Diversey Parkway

Chicago, Illinois



* This Volume-Pressure Gun and Hose—plus a few fittings—are all you need to modernize any crawler-type machine.

For Crawler-Type Equipment Alemite Lubrication Engineers Specify—

For Track Rolls equipped with plain bearings—Alemite Tempri-E.P. Tractor Roll Light.

For Track Rolls equipped with anti-friction bearings—Alemite Tempri-E.P. Tractor Roll Heavy.

Both of these lubricants have been developed for extremely heavy duty. They have high cushioning power, are water repellent, very adhesive and will not thin out at high temperatures.

ALEMITE
Reg. U.S. Pat. Off.

Controlled Application of the Correct Lubricant

Casting and Driving 936 Concrete Piles

(Continued from page 23)

inequalities in the driving head. Also at frequent intervals during the day discs of gumwood were placed under the hammer to cushion the blow somewhat. When the pile was first placed with its tip in place on the ground and the tackle released it sank several feet into the ground, and when the heavy hammer was allowed to rest on top of it the pile sank in a few more feet. The penetration per blow of the hammer varied from 1 foot at the start to about $\frac{1}{4}$ inch per blow when the proper elevation had been reached.

Casting and Curing Concrete Caps

Each cap for the 6-pile bents was 43 feet 4 inches long, 2 feet deep and 3 feet 3 inches wide. The forms were built up on top of the piles, using 2-inch wood lined with Masonite. The concrete for pouring was brought out from the mixing plant on flat cars in the 2-yard buckets and lifted to the forms by a Koehring crane which also handled the 1,325 pounds of reinforcing steel placed in each cap. The bars ranged from $\frac{1}{2}$ to 1 inch square and deformed.

As soon as the forms were stripped, usually in 24 hours, the caps were covered with burlap and sprinkled regularly for 14 days. It was necessary to do this work by hand and each bent had a ladder placed against it and the laborer on this duty climbed one bent after another, keeping each one wet for the entire time. The curing water was provided for both the yard and the caps by a 4-inch electric centrifugal pump located about $\frac{1}{2}$ mile distant. A small crew was maintained at the yard and along the contract at night for curing and setting pile forms.

The working hours for this NRH contract were 30 hours per week with two crews a week. All drinking water for the casting yard and for all laborers over the job was brought in by tank car from an artesian well at Norco, La., about 3 miles away.

Personnel

The Kelher Construction Co., of Dallas, Texas, was the contractor for this project with Gordon Walker in charge of construction operations. For the Louisiana Highway Commission, W. L. Thompson was Resident Engineer.

Of the 3,040,000 miles of rural highways in the United States only 920,000 miles have been improved and of this but 160,000 miles have been improved with high type surfacing. State highway departments have jurisdiction over 360,000 miles; counties and townships have jurisdiction over 2,680,000 miles.

From a paper by H. C. Whitehurst presented before the American Road Builders' Association.

CONSTRUCTION EQUIPMENT

McKERNAN-TERRY

Pile Hammers, Pile Extractors

LAMBERT-NATIONAL

Hoists, Derricks, Cableways and Whirlers

STEELE & CONDICT

Special Machinery, Movable Bridge Machinery

Write for descriptive catalogs

McKiernan-Terry Corp.

19 Park Row, New York

Distributors in Principal Cities



One of the New Austin-Western Large-Capacity Trail Cars Equipped with Special Dump Bodies

New Line of Trail Cars with Special Dumps

A line of trail cars in 6 to 31-cubic yard or 8 to 25-ton sizes for handling rock, dirt and other bulky materials of heavy weight has been announced by the Austin-Western Road Machinery Co., Aurora, Ill.

Engineered for maximum pay-load operation, these cars, which are mounted

on rubber tires, have features similar to those employed in the construction of railroad dump cars. Equipped with bottom or side-dump doors which operate by air, hydraulic or mechanical controls, A-W trail cars come in three standard body designs including special built-to-order constructions.

According to the manufacturer these cars will haul more than double the load that a truck tractor can carry on its own chassis. Features include a full uni-

versal, gravity-cushioned "fifth" wheel for rough surface travel without strain or distortion; generous ground clearance for easy dumping; low overall height for quick, convenient loading; dumping controlled by the truck driver from the cab; short turning radius with ample clearance; massive, semi-elliptic springs, mounted directly under the center sills; as well as automatic safety dumping devices.

New Link-Belt Distributor in Mexico

Announcement has been made by Link-Belt Co., Chicago, Ill., of the appointment of the General Supply Co., S. A., Calle Balderas No. 56-58, Mexico, D. F., as distributor of Link-Belt conveying and power transmitting machinery in the Federal District and State of Mexico. The General Supply Co., established about 30 years ago, is headed by Albert Isaac, President, and K. O. Nellen, Manager.



Big jobs are before the big operator for 1935. Get yourself ready. Road building, Railway reconstruction and maintenance, Ships to be built.

F.H.A. activities. Hundreds of millions to be spent. Don't buck or balk or cuss. Let's get some of that business.

We are making better wire rope than we ever thought could be made—New engineering ideas.

Write us about your needs. Give us a chance to help you on your problems.

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On Rock and Dirt Jobs Standardization Saves By Fewer Spare Parts

The use of varied and sundry kinds of equipment for hauling excavated material has a tendency to increase the time losses and decrease production. Equipment is subjected to extremely hard usage and mechanical troubles invariably occur from time to time. It is much cheaper and less difficult to keep an adequate supply of spare parts on hand when the equipment is closely standardized than when a variety of different kinds and sizes of equipment is used. Standardization of hauling units permits interchange of parts and one line of spare parts will suffice for all the hauling equipment.

If more than one shovel is employed, there is the same advantage in having them alike. This will permit not only the carrying of smaller investment in repair parts but operators can be shifted from one piece of equipment to another without impairment of efficiency. Repair men will become more expert in making repairs as well as in diagnosing trouble and in the routine care of the equipment.

Equipment earns no profit except when working. Anything which helps to keep and continue the equipment in working order is therefore of definite value to the contractor. Standardization of equipment so as to permit a wide interchangeability of parts usually requires no outlay and only a little definite planning and forethought, and should be embraced by all contractors to whatever extent their lines of work will permit.

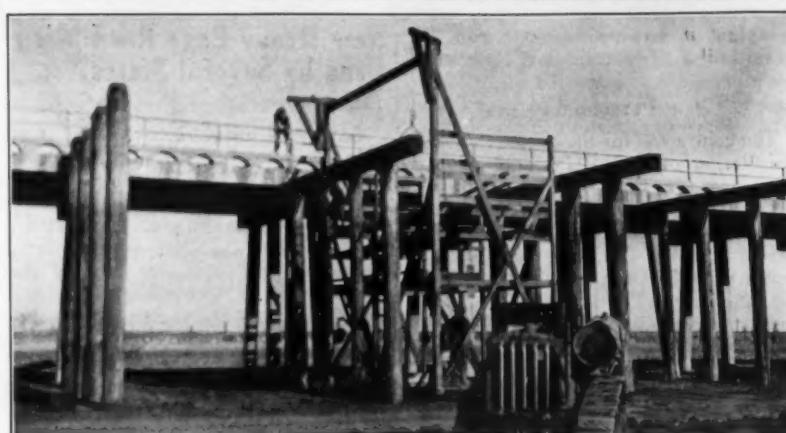
Excavation a Problem of Hauling

The most striking fact brought out by recent studies of the U. S. Bureau of Public Roads is that power-shovel grading work is more a problem of transportation than of excavation. If the hauling equipment is insufficient or is not operated with precision, the shovel is handicapped, production is relatively low, and unit costs are high. On the other hand, if too many hauling units are used, unit production costs are unnecessarily increased while the problem of proper operation of the hauling units still remains. Therefore control and operation of the hauling equipment requires the constant and most painstaking attention of the management.

Coordinate All Parts of the Job

This attention to the hauling should not be given at the expense of an almost equally vigilant attention to all other parts of the job. The contractor can never afford to forget that the shovel is the key item of equipment. It must be constantly maintained in proper condition and operated with a high degree of skill and judgment. Operations on the dump must not be allowed to hamper or interfere with the rapid and orderly movement of the hauling units. If the ground is too hard to dig readily, drilling and blasting must also be carried on with efficiency and dispatch.

But, even all this is not sufficient. Real efficiency is attained only when all operations are performed efficiently and at the same time so coordinated and synchronized that all of these several operations proceed methodically and without interference as a definite part of one single process. To attain such a degree of efficiency in power-shovel grading work requires the constant attention of managerial ability of the highest order. However, the rewards to be gained from such management are such that no grading contractor can afford to be without it.



A Total of 3,550 Piles Were Driven to Support the Bridge Flooring

3-Mile Trestle Widened for Safety of Traffic

For over 15 years a narrow 21-foot roadway on a 3-mile long trestle carried traffic across a bypass to take care of the flood waters of the Sacramento River, west of Sacramento, in California. The narrow bridge, through the seasons, was the scene of many serious traffic accidents. As no sidewalk was provided in the original structure, there were many accidents to pedestrians, some of which were fatal. To make the trestle safer for all kinds of travel, its 21-foot width has been widened so that there is now a clear roadway width of 42 feet with one 3-foot sidewalk.

A total of 3,550 piles had to be driven to support the roadway. This piling and the timbers used in the spans are from the famous redwood forests of the western mountains. Where the trestle spans

a slough, the old structure had a bascule span with a single lift through a plate girder and this could not be widened without leaving an obstruction in the roadway. The old bascule was removed and replaced with a double-leaf bascule having a total span of 85 feet between trunnions. No power machinery is provided for operating this bascule as openings of the span are expected to be very rare. The leaves of the bascule are built in sections so that, in an emergency, they may be lifted by the derrick boom of a dredger.

New Loadmaster Distributor

John Bouchard & Sons Co., of Nashville, Tenn., has recently been appointed by the Bucyrus-Erie Co., South Milwaukee, Wis., as distributor for Loadmaster cranes in the central portion of Tennessee. The quarters of this distributor are located at 11th Avenue North and Harrison Street in Nashville.

Truck Operators' Handbook

The 44-page 1935 edition of the Operators' Handbook, designed for the use of all those interested in tire performance, has recently been announced by the B. F. Goodrich Co., Akron, Ohio. Among the new features included in this year's volume are, a page on the factors governing the proper tire selection, and a Load and Service Diagram, which illustrates the effect of overloading on the ultimate service of a pneumatic tire.

There are two pages on load analysis, furnishing easy methods to determine tire loads and total axle loads for trucks, tractor semi-trailers and tandem assemblies. The Goodrich Tire Calculator is illustrated, by which the tire combination to carry a given load is easily determined, and a table on the spacing of dual pneumatics. Methods by which truck operators may determine the tire cost per mile on each installation are also presented.

Copies of this booklet will be sent free on request to readers of CONTRACTORS AND ENGINEERS MONTHLY by the B. F. Goodrich Co., Akron, Ohio.

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CONSTRUCTION MACHINERY COMPANY

500 Glenwood St., Waterloo, Ia.

WORTHINGTON ROCK MASTER Performs at Grand Coulee

IN THE HARDEST BLUE GRANITE ever encountered by old time "hard rock" men.. the Rock Master averaged 10 feet of hole per hour against a 2-foot maximum by ordinary drills.

... and in tough "tombstone" granite, 15 to 18 feet of hole per hour.

The Rock Master not only drills faster, but its easy portability saves valuable moving time.



"This blue granite is the hardest rock I ever struck in a lifetime of drilling" said the drill superintendent on the job. It was in this material that the Rock Master averaged 10 feet of hole per hour.

THIS Worthington Portable Compressor supplied the air for the Rock Master...and a couple of the conventional hand drills at the same time... AND KEPT THEM GOING.



Get the details before you tackle your next rock job

WORTHINGTON PUMP AND MACHINERY CORPORATION
General Offices: HARRISON, NEW JERSEY
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WORTHINGTON



A-6510

Concrete Pipe Laid in Ten Days

(Continued from page 18)

pipe was unloaded at the trench by hooking two wooden skids to one of the steel pipes of the cradle and slowly rolling the pipe to the ground with a rope around it snubbed to the other steel pipe of the cradle.

Laying the Pipe

A Northwest pull shovel was used to dig the trench and lay the pipe. Sufficient trench to lay one length of pipe was dug, then the machine swung to pick up a length of pipe with a cable sling. The pipe was lowered into the trench, and the spigot end pushed home into the bell of the pipe already laid, before the machine moved on to dig out for the next length of pipe. Two men with shovels leveled off to exact grade for each length of pipe with the aid of a wooden right angle held against the end of the last pipe laid and having a long leg running lengthwise with the bottom of the trench.

A lead gasket with fibre-core was placed in the bell of the pipe in the trench, just before the next pipe was laid. This gasket was caulked from the inside of the pipe into the wedge-shaped recess formed between the bell and spigot rings. After the trench was back-filled, this gasket was given a final caulking and the inside joint space filled with mortar to produce a continuous flow line.

The work in the trench was carried on by two 6-hour shifts. All of the first shift and the first three hours of the second shift were spent in digging, laying pipe and backfilling by hand to one foot over the top of the pipe. During the last three hours of the second shift, the Northwest went back over the day's work, completing the backfill to a depth 3 feet 6 inches over the top of the pipe, while the hand laborers finished the backfill on the last few pipe laid.

Before the backfill reached the top of the pipe, one man poured grout into the outside of each joint, this space having been kept open and free of dirt by a band of burlap-backed paper wrapped around each joint as the pipe was laid.

Pipe laying averaged twenty lengths per day, with a maximum of thirty lengths laid in six hours where the trench was of minimum depth.

Labor Organization and Hours

In order to provide a properly balanced job, the contractor operated the pipe manufacturing plant 40 hours per week, under the Concrete Pipe Manufacturers Code. The remainder of the job was operated 30 hours per week, under the usual PWA regulations. In

the plant it was necessary to run the steam boiler 24 hours a day, for curing the pipe.

Personnel

The contractor for the production and installation of this 19,000-foot supply main for the City of New Bedford, PWA Project 2308, was the Lock Joint Pipe Co., for whom L. G. Wilhelm was Superintendent. The work was done at a unit price of \$10.90 per foot for furnishing and laying the pipe. The total amount of the bid was \$207,100.00. The work was done for the Water Department of the City of New Bedford, Mass., Stephen H. Taylor, Superintendent, with Howard Mandel as Engineer and Frederick W. Anthony, Inspector.

A local contractor in Ohio, reports the United Press, walked up and down the main street for two hours trying to find men who would go to work on a job. A score refused on the ground that a small job would endanger their relief status.

—B. T. E. A. News-Letter, New York.

New Heavy-Edge Road Mesh Used by Several States

Expanded metal road mesh, a recent development of the Consolidated Expanded Metal Cos., Wheeling, W. Va., was included in the 1934 specifications of the Pennsylvania State Highway Department and was used successfully on several of the paving projects of that state during the 1934 season. Some other states also provide for the use of this new road mesh.

This new reinforcement, a feature of which is its heavy edge, is manufactured by the Steelcrete process which subjects every strand of the metal to cold drawing during manufacture from plate steel. It is a two-way reinforcement, distributing all strains and providing reinforcement longitudinally and transversely. Its machine-made sectional area is claimed to assure absolute structural value and it may be placed in position as the mixing progresses, without holding up the work.

Heavy-edge expanded road mesh is immediately available to meet specification requirements of any road job where heavy-edge reinforcement is specified.



Operated by One Man.
Capacities: 10 to 600
cu. yd. per hour.

Crescent Scrapers
for
long range
dirtmoving

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464 S. Clinton St.,
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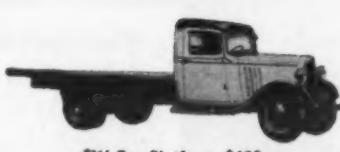
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Truck owners
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THAT'S WHY THEY
BUY CHEVROLET
TRUCKS



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(131" Wheelbase)



1 1/2-Ton Open Express, \$655
(131" Wheelbase)



*1 1/2-Ton Platform, \$630
(131" Wheelbase)



*1 1/2-Ton Chassis, \$485
(131" Wheelbase)

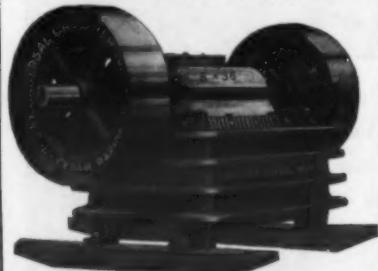
Men who study haulage costs know that Chevrolet trucks are as outstanding in economy and durability as they are in price. Chevrolet trucks handle tough hauling jobs day after day at small operating cost, because they are built to Chevrolet's own high standards of quality in every part. The powerful six-cylinder valve-in-head engines are truck motors,

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN
Compare Chevrolet's low delivered prices and easy G.M.A.C. terms. A General Motors Value

At left and above are list prices of commercial cars at Flint, Michigan. *Dual wheels and tires \$20 extra.
Special equipment extra. Prices subject to change without notice.

CHEVROLET TRUCKS
World's Lowest Prices

ROCK CRUSHERS TO MEET EVERY NEED



Stationary and portable Crushers—Elevators—Conveyors—Screens—Bins—Pulverizers—Crushing Rolls Complete plants in many sizes built to meet individual requirements.

Write for catalogue and tell us your needs. Our engineers will help solve your problem.

UNIVERSAL CRUSHER CO. 620 C Ave., West Cedar Rapids, Ia.

Best Types of Blades For Road-Mix Work

Information on the design of moldboards and blades best adapted for road-mix construction was desired by the Highway Research Board. They therefore sent the following questions to several highway departments and others particularly interested in this type of work: 1. Best length of blade for road-mix construction; 2. Minimum height of blade; 3. Radius of curvature of the blade; 4. Maximum angle at which the blade should be able to operate. (Zero degrees parallel to the axis of the machine.)

The accompanying table shows a summary of the answers received.

Source	Length Feet	Height Inches	Radius Inches	Angle Degrees
S. Carolina	10 to 12	20	14½ to 17½	45
Missouri	12	15	11 to 14	75
Wyoming	10 to 12	21½	14	45
Nebaska*	10 to mix			
	12 or 14			
California	to spread	20 to 24	12 to 15	75
Arizona**	10 pref.	19	12 to 18	42 to 52
	12	21	15	45 mix
Asphalt Inst.	12	16 min.	15 max.	56 spd.
		18 to 20	14 better	60 to 75
				pref.

*The flat cutting edge of the blade should be in a nearly vertical position.

If the blade is too flat (over 15 inches in radius), it is necessary to tip the blade far forward and operate it at a smaller angle with the line of travel. For the blade of 15 inches in radius, the top and bottom edges are set in nearly the same vertical plane. Credit for fast mixing is given to the operation "heeling over", where the heel of the blade picks up part of the windrow, pushes it over the top and allows it to roll down the far side of the windrow. The crawler machine operates in second gear and makes 3.7 miles per hour.

Abrasive-Resistant Cable

A new cable with a loom-woven sheath, for use on reel locomotives and similar applications where the cable must withstand severe mechanical abrasion, has recently been announced by the General Electric Co., Schenectady, N. Y.

The finish of this cable consists of a circular-loom-woven sheath, under which is a layer of Glyptal cement, the sheath being so applied that it is embedded in the cement and partially embedded in the rubber insulation. This process results in a cable which is tough, abrasive-resisting and, because of the Glyptal cement, highly resistant to oil, alkali or acid.

Strength of Concrete With Carbon Emulsion

The Columbian Carbon Co.'s Industrial Fellowship at Mellon Institute, Pittsburgh, Pa., recently completed a series of tests on the effect of HiBlak, an emulsified carbon, on the strength of concrete. These tests were made for Binney & Smith Co. The results of compression tests on mortar cylinders showed that specimens containing HiBlak had greater strength with slightly longer curing or setting time. Concrete cylinders were prepared for these tests from mixes of the standard formula; the black specimens contained the carbon black added as HiBlak, the water in the emulsified carbon being calculated as part of the total water. The results of the tests showed practically the same strength for the control and black specimens after 7 days setting but appreciably greater strength for the black specimens after 28 days setting.

Beams 36 inches long x 3 inches square, broken first with a 34-inch span and then each half broken with a shorter span, showed that the modulus of rupture of beams containing HiBlak developed a cross bending strength noticeably greater than that shown by the control beams. The series of tests on the resistance of mortar to freezing and thawing were run on a series of 2-inch mortar cubes, the black group containing 8 per cent HiBlak or 2 per cent

carbon black on cement. After some 100 cycles of freezing and thawing, there was negligible failure in any of the specimens, and compression tests on the treated specimens showed negligible loss in strength.

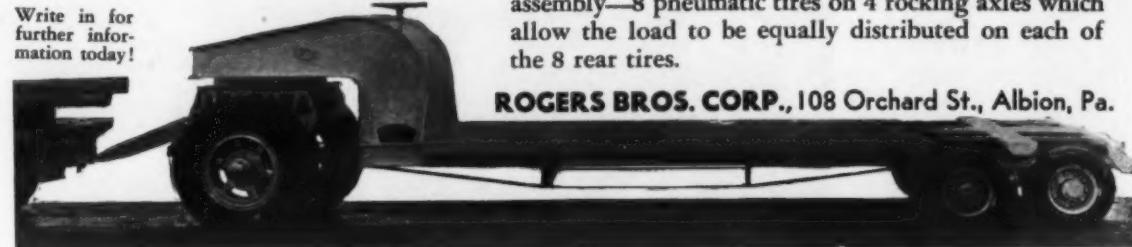
The use of three quarts of HiBlak per bag of cement which gives approximate-

ly 2 per cent carbon black by weight on cement or 8 per cent HiBlak as emulsified, in either a mortar or concrete preparation, actually improves the strength of the mortar or concrete as shown by compression tests on mortar specimens and by the compression and cross-bending tests on the concrete specimens.

This dosage of HiBlak is sufficient to give approximately the maximum blackness obtainable with the carbon emulsion. The freezing and thawing test indicated that the use of HiBlak did not lower but actually improves the resistance of mortar and the concrete to exposure and weather conditions.

This new type of ROGERS TRAILER has 10 pneumatic tires and a carrying capacity of from 10 to 40 tons.

Write in for further information today!



Like all the other ROGERS TRAILERS, it is low-bounding and easy to load, and very strong in proportion to capacity.

A special feature of this particular model is the rear assembly—8 pneumatic tires on 4 rocking axles which allow the load to be equally distributed on each of the 8 rear tires.

ROGERS BROS. CORP., 108 Orchard St., Albion, Pa.

LINK-BELT SHOVEL NEWS

for Contractors, Road Builders and Engineers

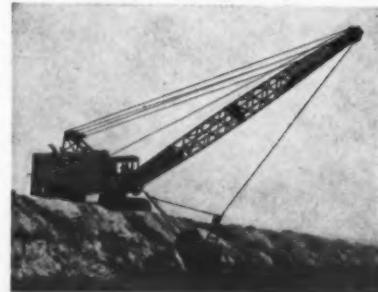
25,000,000 Tons of Granite



That is the estimated quantity of granite rock still remaining in this 126 year old quarry of the Port Deposit Quarries Co., Inc., Port Deposit, Md.

This Link-Belt K-30 crawler gas crane is rendering continuous, dependable service in handling all sizes of stone, from the "one and two man size" which is shown being loaded into cars from a hand-filled tray, up to large blocks weighing as much as 17 tons.

Utah Lake Channel Project



Utah Construction Co. and Morrison-Knudsen Co., acting jointly, recently completed work on this emergency drought relief project. It involved the digging of a new and deeper outlet on Utah Lake near Salt Lake City, to permit the flow of water which had receded below the regular channel.

Four Link-Belt heavy-duty K-55 draglines rendered their usual, dependable, speedy service on this job.

In November, 1934, Utah Construction Co. purchased two more K-55 draglines making a total of seven Link-Belts purchased by that company since 1928.

At the Bonneville Dam



Columbia Construction Company's Link-Belt shovel loading ballast used for sinking cofferdam cribs, for the main spillway dam of Bonneville project in Oregon.

Several Link-Belts are used by Orino, Bell & Malcolm on their \$847,247 contract covering the relocation of O. W. R. R. & N. Co. railroad along the Oregon shore, as part of the Bonneville dam and navigation project—42 miles east of Portland. This re-location work necessitates driving a 550-ft. double-track tunnel; building two steel bridges on concrete piers, and one concrete arch bridge; 150,000 cu. yds. of solid rock excavation; 250,000 cu. yds. of common excavation; 10,250,000 sta. yds. of overhaul; and 300,000 cu. yds. producing and placing riprap.

Regarding Stability

This Link-Belt K-55 dragline owned by R. H. Risser, Hazleton, Pa., is shown stripping anthracite coal. It is equipped with a 2-yd. bucket and 85-ft. boom, and at times has stripped to a depth of over 60 ft.

Equipped with a 3 cu. yd. clamshell bucket, weighing 7000-pounds empty, and approximately 11,000-pounds loaded, it is also used for loading coal from storage to cars. In this work it is operated at a radius far in excess of its rated lifting capacity, but in spite of this is working very satisfactorily.

Operating on a 70-ft. radius the machine loads a 99 cu. yd. car with 10% topping, in 22 minutes, requiring 38 passes of the bucket. Anthracite coal weighs approximately 55-pounds per cu. ft., so the average load is approximately 2 tons of coal, or an output of between 75 to 80 tons in 22 minutes. This is an average rate of better than 100 trips per hour. It is an example of the unusual stability and large capacity obtainable with Link-Belts.



LINK-BELT COMPANY
300 W. Pershing Road,
Chicago, Ill.

Put my name on mailing list to receive Link-Belt Shovel News.

Name _____

Firm _____

Address _____

City _____



State _____

Contractors and Engineers Monthly

New Bridge Flooring

A new reinforced armored heavy-duty floor and bridge deck, known as I-Grid, has recently been announced by Truscon Steel Co., Youngstown, Ohio. This new flooring is a combination of many of the features of Truscon Teegrid plus the additional features of lighter weight, proper balancing of the stresses in the steel and concrete in the completed slab, and a non-skid wearproof surface.

I-Grid is made up in diamond forma-

tion for gripping tires and preventing skidding, protecting the concrete from traffic wear and reducing the cost of repairs and wearing surface renewal.

The steel units are light in weight and easily handled. Field welding is simple in arrangement and quickly done at low cost. The concrete is easily placed and it is not necessary to use excessively fine aggregate. Heavy flanges give stiffness before the concrete is placed so that substantial loads can be safely applied during construction.

P. C. A. Appoints Fleming Manager, New York Office

The Portland Cement Association has announced the appointment of E. M. Fleming as District Manager in charge of the New York Office, effective March 1. For the past six years, he has been Manager of the Highways and Municipal Bureau of the general office in Chicago.

Fleming joined the staff of the Association in 1926 as a field engineer in the

Indianapolis district. In 1928 he was transferred to the general office and served as Street Engineer in the Highways and Municipal Bureau for one year.

While Manager of the Highways and Municipal Bureau, he directed the Association's concrete road condition survey of over 6,000 miles of concrete roads in ten states. He also directed the construction of the Elmhurst cement-bound macadam test road, built by the Association to get data on the best methods of building this type of pavement.

Here's how the sheet asphalt pavement on Summer Street, Burlington, Iowa, looks today. It was laid over old two-course brick paving in 1926.

Eight
Years



ASPHALT—Proved by Years of Service

STANOLIND PAVING ASPHALT has been proven, time and again, by the one completely satisfactory test for any paving material—service, over a period of years. The examples pictured here are typical—not unusual. There are hundreds of similar instances proving the splendid serviceability of Stanolind Sheet Asphalt Pavement. When correct types of construction are selected and the right methods employed, Stanolind Asphalts invariably make satisfactory pavements. Let the Standard Oil (Indiana) representative show you specific examples of pavement types fitted to your own particular needs.



Copr. 1935, Standard Oil Co.

Eleven
Years



Iowa Street, Dubuque, Iowa, was paved with Stanolind Asphalt Cement in 1923. This pavement is now reported to be in very good condition.

ASPHALT *for every Purpose*

ASPHALT FOR PAVING . . . ASPHALT

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Table 1
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Losing Profits through Lost Time

(Continued from page 13)

about 3 hours after spreading and with the mixture approaching normal temperature. There is considerable reason for believing that the last stages of rolling produced practically no effect.

The spreading and rolling operations are conducted so as to produce smoothness and riding comfort. The test for smoothness is usually made with a 10-foot straight-edge. However, with cars traveling 40 miles per hour or 59 feet per second a surface which meets the requirement as to smoothness within 10 feet may have variations over greater distances which will produce riding discomfort. The regularity of the surface left by the finishing machine is entirely dependent on the vertical alignment of the side forms and the firmness of their support. It is therefore important that the forms be set conforming to the proper vertical alignment and be supported so as not to deflect under the weight of the finishing machine.

Table 10.—Elapsed Time in Rolling Operations and Corresponding Drop in Temperature of Pavement

Operation	Temperature drop		Elapsed time
	From	To	
Spreading	° F.	° F.	Minutes
Finishing	290	275	2
First rolling	275	245	7
Second rolling	245	216	15
Third rolling	216	174	41
Fourth rolling	174	170	43
Fifth rolling	170	161	58
Sixth rolling	161	158	63
Seventh rolling	158	129	143
			183

(To be concluded in May)

New Adjustable Screeds Make Crown or No Crown

Because a great many state highway departments require the flattening of a pavement surface around curves, the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., has developed a quick adjustable screed for crown elimination. The screed can be installed on any Ord or gas-electric type finisher and can be used for either concrete or bituminous road construction. The adjust-

ment in crown is made while the finisher is in operation by simply turning an adjusting spider device. A gage indicates the degree of change and the true crown at all times.

As an example of the operation of this adjustable screed, take a case where the transition from a 1½-inch crown to a flat surface is made through a distance

of 75 feet in approaching a curve and similarly, the last 75 feet coming out of the curve is used to return gradually from the flat surface to the 1½-inch crown. Using a standard screed, it would be necessary to flatten the screed and recrown it or substitute a flat screed. With the new screed the adjustment can be made gradually and smoothly.

Colorado County Buys Grading Equipment

Delta County, Colo., has recently purchased from the H. W. Moore Equipment Co., of Denver, Colo., a Lakewood grade rooter and a No. 14 Galion lean-ing-wheel grader.

More Profit With New Kinney Distributors

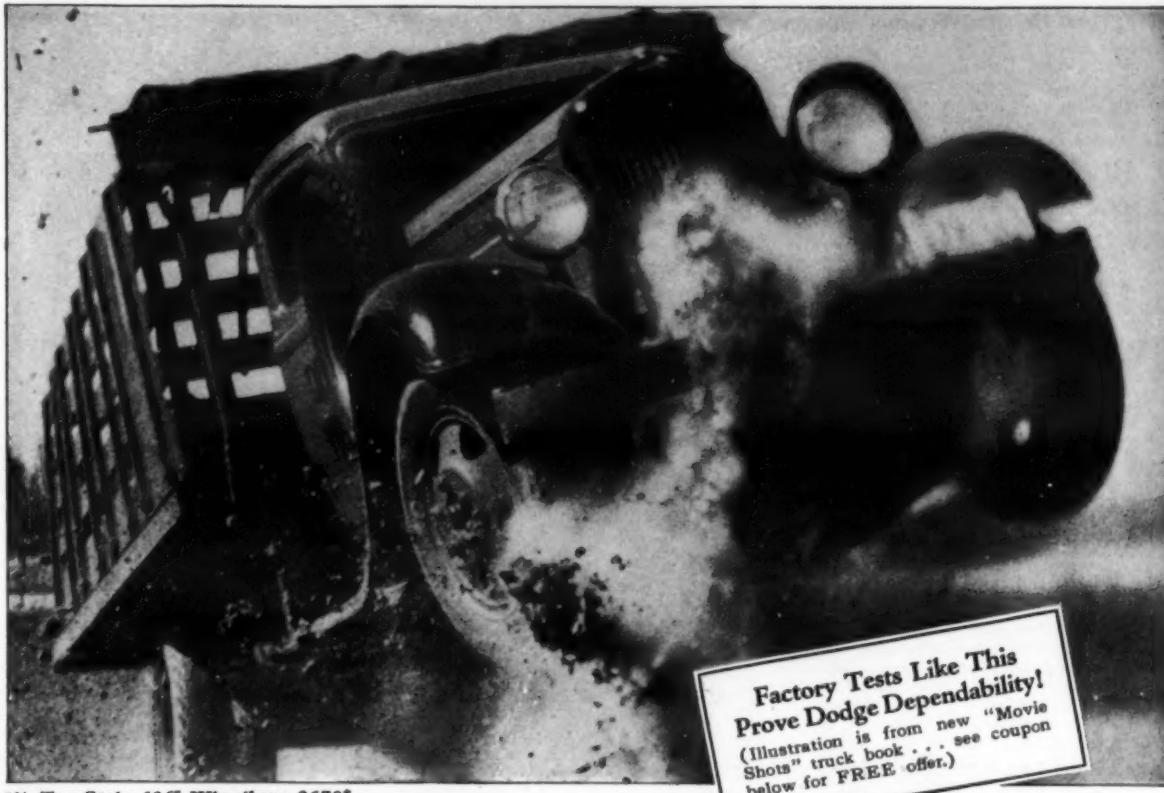
Definite records prove Class A Kinney Distributor has a superior pump; loads faster; gets to job faster; and applies faster; thereby earning more on its investment than any other.

The cost of overhauling your old models may equal first payment on a new Kinney which will do twice the work with the same license and operator costs.

Wire collect to nearest office for Kinney man to discuss this in detail.

KINNEY MFG. CO., 3531 Washington St., Boston, Mass.

New York, 30 Church St.; Philadelphia, 725 Commercial Trust Bldg.; Chicago, 1202 Buckingham Bldg.; Kansas City, Mo., 517 Finance Bldg.; Los Angeles, 1333 Santa Fe Ave.



ROAD GRADER WANTED

A used or rebuilt, motor driven, crawler type road grader wanted by the Borough of Ridgway. Give specifications, condition and price.

G. F. GREINER, Secretary,
Ridgway, Pa.

SALESMEN WANTED

United Laboratories, Euclid Ave. at Ivanhoe, Cleveland, Ohio, has a few open territories for salesmen with Industrial Sales or Engineering experience. Regional offices and warehouses at convenient locations. While no investment is required, the man we select will have sufficient capital and confidence in his ability to desire to work on a straight commission.

DODGE TRUCKS... Built to Last Years Longer Now PRICED WITH THE LOWEST!



1½-TON CHASSIS—6-cylinder, 131-in. or 136-in. wheelbase, with 18 high-priced, quality features that save gas, oil, tires, upkeep—make truck last far longer! \$490*



1½-TON CHASSIS AND CAB—6-cyl.—136" w. b.—Full-floating rear axle, hydraulic brakes, valve seat inserts, roller-bearing universals—18 recognized, money-saving features. (Body, hoist and special equipment extra)..... \$640*

Dependable DODGE TRUCKS

No Wonder Thousands Who Have Tried All Three Lowest-Priced Trucks Are Switching To Dodge

"WE NEVER dreamed we could get a long-life truck like this, priced with the very lowest" . . . Everywhere, buyers who check Valve Seat Inserts the three lowest-priced 1935 trucks are expressing amazement. Dodge leads the other two by a tremendous margin, they find, in known, acknowledged, recognized, high-priced truck features.

You know a truck with an oil filter is better. Yet only Dodge of the three lowest-priced trucks gives you an oil filter. You know that 4 piston rings or 4 main bearings must be better than only 3—yet Dodge alone gives you 4 full-floating rear axle of each, the others 3.

Dodge perfected hydraulic brakes stay equalized, save tires, brake lin-

ings and adjustment expense. Yet only Dodge of the three lowest-priced trucks gives you hydraulic brakes.

Before you buy any truck, get a "show-down" of these money-saving facts about the 1935 Dodge. Go to your Dodge dealer . . . or mail the coupon for big, profusely illustrated, "Movie Shots" truck book.

DODGE DIVISION—CHRYSLER MOTORS

*All prices f. o. b. factory, Detroit, subject to change without notice. Special equipment, including dual wheels on 1½-ton models, extra. Ask for the official Chrysler Motors Commercial Credit Plan.

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Please send me FREE your big, illustrated "Movie Shots" book.

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Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

Power-Gun Lubricating Equipment

332 Complete information on Alemite Power-gum equipment for the controlled application of the correct lubricant to construction and road equipment may be secured by those interested from the Alemite Corp., Div., Stewart-Warner Corp., 1850 Diversey Parkway, Chicago, Ill.

New Modern Road Roller

333 Huber Manufacturing Co., Marion, Ohio, will be glad to send to interested contractors and highway engineers complete information on the many features of the new modern Huber road roller.

Crushing and Screening Equipment

334 Good Roads Champion 2-in-1 roller bearing crushers, washers, screens and complete sand and gravel plants are described in literature which the Good Roads Machinery Corp., Kennett Square, Pa., will be glad to send to interested contractors and engineers.

New 27-E Paver Has Many Features

335 The new Model S 27-E Ransome paver, which retains many of the features of previous models but which also is improved and simplified in several ways, is described and illustrated in literature which the Ransome Concrete Machinery Co., Duncellen, N. J., will be glad to send on request.

New 85-CFM Compressor

336 Ingersoll-Rand Co., 11 Broadway, New York City, in its Bulletin No. 2149 describes the new Model 85 two-stage air-cooled portable compressor driven by a Waukesha gasoline engine and having a capacity of 85 cfm at 100 pounds. Improvements and refinements combine to make a saving of up to 25 per cent in this machine over the fuel cost of water-cooled single-stage portable compressors.

Air Filters for Construction Equipment

337 Air-Maze Corp., 812 Huron Road, Cleveland, Ohio, will be glad to send to those interested complete information on Air-Maze air filters, the use of which is claimed to increase the power and life of construction equipment.

Rock Drilling Equipment

338 Complete information on Worthington rock drilling equipment, including the pneumatic self-feed drifter, hole spotter, multiple drilling rig, and wagon drills, may be secured by those interested from the Worthington Pump & Machinery Corp., Harrison N. J.

Complete Line of Construction Machinery

339 Literature describing Wonder tilting mixers, hoists, pumps, wheelbarrows, concrete carts and similar equipment made by the Construction Machinery Co., 500 Glenwood St., Waterloo, Iowa, may be secured by those interested direct from the company.

Excavators for All Digging Problems

340 A handy-sized volume for reference in selecting the size and type of excavator exactly suited to any excavating or material handling work has been issued by Bucyrus-Erie Co., South Milwaukee, Wis. It contains general facts about each machine and a summary of the general specifications. Examine this and then send for the latest complete specifications on the machine you need.

SEND THIS BACK - WE'LL DO THE REST

CONTRACTORS and ENGINEERS MONTHLY
470 FOURTH AVE., NEW YORK

Please send me the following literature, without cost or obligation

(Indicate by numbers)

Name -----
Firm -----
Street -----
City -----
P.S. Also send me catalogs and prices on -

Tires for Construction Service

341 Complete information on Firestone gum-dipped tires for every construction service, offering long mileage and economy, may be secured by those interested from the Firestone Tire & Rubber Co., Akron, Ohio.

What Is a Diesel?

342 An informative little booklet, containing answers to many of the questions commonly asked about diesel engines, with special notes on the Waukesha Comet diesel, may be secured from the Waukesha Motor Co., Waukesha, Wis. Ask for Booklet 957.

Special Attachments for Special Needs

343 This is the title of a new booklet illustrating and describing the various attachments, ranging from bumpers to power take-offs, for use with tractors. Copies of this booklet may be secured free upon request from the Caterpillar Tractor Co., Peoria, Ill.

A New Grader Catalog Free

344 The new Adams leaning-wheel grader catalog, describing and illustrating the features and operation of Adams leaning-wheel graders, may be secured free on request by contractors, highway engineers, and maintenance men from the J. D. Adams Co., Indianapolis, Ind.

A Complete Service Truck

345 The Ditwiler Redi-Service 1½-ton truck, with an all-steel body and top, carrying a 140-cubic foot air-cooled air compressor, a 300-ampere arc welder and a 250-gpm centrifugal pump all operated by the truck engine through a Ditwiler split-shaft power take-off, is designed and built by the Ditwiler Manufacturing Co., Galion, Ohio, and described in detail in its illustrated literature.

Concrete and Road-Mix Equipment

346 The latest catalog, No. 35-A, issued by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, is in handy indexed form containing condensed references to all of the products of the company including pumps, mixers, plaster mortar mixers, bituminous mixers, hoists, concrete paving equipment, truck mixers and miscellaneous road machinery.

Weighing Aggregates Under Water

347 Complete information on the Fairbanks under-water weighing method, as well as on the many other Fairbanks scales for the construction industry, may be secured by those interested from Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

Vibrators for Concrete

348 The Mall 2-hp 3,600-rpm gasoline-engine concrete vibrator, with attachments available for concrete surfacing, is described in a catalog which the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill., will be glad to send on request.

Diesel Power for Construction Equipment

349 Information on Cummins diesel engines for construction and maintenance equipment, in sizes from 35 to 200 hp, offering economical and efficient power, may be secured by interested contractors and engineers from the Cummins Engine Co., Columbus, Ind.

New Pictorial Reference Catalog

350 The Austin-Western Road Machinery Co., Aurora, Ill., has recently issued its 1935 pictorial reference catalog, 1365, which describes and illustrates all Austin-Western equipment for road construction and maintenance. Write for your copy.

Unbelievable ECONOMY



PUT a Diesel-powered McCormick-Deering TracTracTor on the job and we promise you RESULTS that will seem unbelievable until we demonstrate the facts. Furthermore, only this International Harvester product can produce them—for such reasons as these:

- Exclusive McCormick-Deering design makes TracTracTors by far the most accessible, most easily serviced crawler tractors on the market.
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We will be glad to give you evidence of what others are doing with McCormick-Deering Diesel power in many fields. Perhaps the solution of your power problem is here, in the complete range of McCormick-Deering wheel and crawler tractors and stationary power units. The 30-year experience of the world's largest tractor builder is at your service. Consult the nearest of our 170 McCormick-Deering industrial power distributors or International Harvester branches, or write for information.

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. of America (Incorporated) Chicago, Illinois

MCCORMICK-DEERING DIESEL

THE MCCORMICK-DEERING DIESEL

starts as a regular gasoline tractor. Starts as readily as any gasoline unit of like capacity, in any weather, then switches automatically to Diesel operation on low-priced fuels.

MCCORMICK-DEERING ACCESSIBILITY:

Steering clutches and brakes are reached through cover plates at the rear, without disturbing the tracks, track frames, or driving sprockets. Transmission and other working parts are equally accessible in the TracTracTors.

YOU BE THE JUDGE

The 1935 Ford V-8 Hydraulic Dump has a 1½-cubic-yard capacity without side boards. Load space measures 84 inches long, 66 inches wide, and 12½ inches high.



FORD INVITES EVERY RESPONSIBLE CONTRACTOR TO MAKE HIS OWN TEST OF V-8 PERFORMANCE AND V-8 ECONOMY

INVITATION

Starts like switches in low-revolving gear. Try a 1935 Ford V-8 Truck or Commercial Car with Your Own Loads, Over Your Own Roads, with Your Own Driver at the Wheel.

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THE TRUE TEST of any hauling or delivery unit is WHAT IT WILL DO FOR YOU! How will it handle your loads? Will it enable you to give faster service? Will it cost you less to operate? Ford dealers are so proud of the 1935 Ford V-8 Trucks and Commercial Cars . . . they are so confident of V-8 Performance and V-8 Economy . . . that they invite you to make YOUR OWN TESTS . . . and let YOU decide on the basis of YOUR OWN cost figures and YOUR OWN experience.

THE
1935

FORD V-8

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McKinney Corp.
Glenwood Rock Drill Co.
Marion-Steam Shovel Co.
Hughes-Keanan Co.
Cleaver-Brooks Co.
The Jaeger Machine Co.
Hoover Mfg. Co. (Symmons)
Clyde Iron Works
McKenna-Terry Corp.
Rotary Snow Plow Co.
White Mfg. Co.
Universal Power Shovel Co. Erie Steel Const. Co.

Member: Associated Equipment Distributors

ALLEGHENY EQUIPMENT CORP.

1218 Grant Bldg. Pittsburgh, Pa.

Distributors for

ALLIS-CHALMERS Tractors and Allied Tractor Equipment
"BERG" Highway Surface
GARDNER-DENVER Compressors and Drills
HERCULES Road Rollers
HOUGH-UNIVERSAL Road Sweepers
JACKSON Concrete Placement Vibrators
LINK-BELT Power Shovels and Cranes
MICHIGAN ½-yd. Truck and Crawler Shovels and Cranes
REX Moto-Mixers, Building Mixers, Pavers and Pumps.

R. B. EVERETT & CO.

3112-18 Harrisburg Blvd. Houston, Texas

BLAW-KNOX Road Plant Equipment, Bins, Clam Shell Buckets, Clamp CLEVELAND Wheelbarrows
CLYDE Hoisting Machy. BATES Wire Ties
"P. & H." Gasoline Cranes PULSOMETER Steam Pumps
UNIVERSAL Form Clamps PATENT Safety Swinging
McKenna-Terry Pile Hammers, etc. Backfolding
Hammers, etc. TRU-LAY Wire Rope
CONNERY Asphalt Equip. BUFFALO-SPRINGFIELD Road Builders
CHAIN-BELT Concrete Mixers, Saw Rigs, Pavers NOVO Engines, Hoists, Pumps
BULLIVAN Compactors ETNYRE Asphalt Distributors
WYOMING Shovels, Picks FLYNN SURGRADER
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Wisconsin

Representing
ALLIS-CHALMERS Indus.; Tractor Type Tractors;
Power-Operated Elevators; Blade Graders, Motor Patrol Graders, Track Type Wagons
PIONEER Gravel Equip., Ditchers, Bulldozers, Scrappers, Scrapers, Eliminators
HOUGH-UNIVERSAL KOB Sand Spreaders, Sweepers, WAUBAU Snow Plows, DRAWS
DAVEY Air Compressors, OSHKOSH 4-W. Dr. Trucks
Member: Associated Equipment Distributors

GASH-STULL CO.

Chester Pennsylvania

Representing

FORDSON Tractor and Equipment
UNIVERSAL POWER SHOVEL CO. Unit Shovels ½-yd.
WEHR CO.—Road Graders, all sizes
TRACKSON CO.—Crawler Wagons, Crawlers
MICHIGAN Power Shovels
SCHRAMM Compressors
LOCOMOTIVES
HOISTS—SCRAPERS—WIRE ROPE
MANGANESE DIPPER TEETH

C. H. ARNOLD COMPANY, Inc.

Road and Street Machinery Contractors' Equipment

726-730 Park Bldg., Pittsburgh, Pa.

Representing

ADMUN ENGR. & MFG. CO. Blacktop Paver Forms, Bins, Fibers
BLAW-KNOX COMPANY Blaw-Knox Co.
BUFFALO-SPRINGFIELD ROLLER CO. Road Rollers
THE FOOTE COMPANY Pneumatic Foot Pavers
LITTLEFORD BROTHERS Asphalt Equipment
PIONEER GRAVEL EQUIP. MFG. CO. Crushing & Screening Plants
SULLIVAN MACHY. CO. Compactors & Tools
THE SHOVEL COMPANY Shovels, Cranes, Draglines

THE C. H. JONES COMPANY

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134-140 Pierpont Ave. Salt Lake City, Utah

Distributors

CLETRAC Crawler Tractors and Allied Equipment
GALION Graders and Road Building Machy'
LIMA and BAY CITY Power Shovels
SULLIVAN Portable Air Compressors and Tools
DIAMOND Gravel Crushing and Screening Plants
JAEGER Concrete Mixers, Pumps, Hoists
LINK-BELT Elevating and Conveying Machy'
ATLAS IMPERIAL Diesel and Natural Gas Engines

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CLYDE SALES CO.
DeWALT PRODUCTS CORP.
ERIE STEEL CONSTRUCTION CO.
SAUERMAN BROTHERS, INC.
CHICAGO PNEUMATIC TOOL CO.
STEPHEN-ADAMSON MFG. CO.
ROGERS BROTHERS CORP.
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AEROIL BURNER CO.
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BRODERICK & BASCOM ROPE CO.
CHAIN BELT COMPANY
Also many other lines of Contractors' Equipment

Member: Associated Equipment Distributors

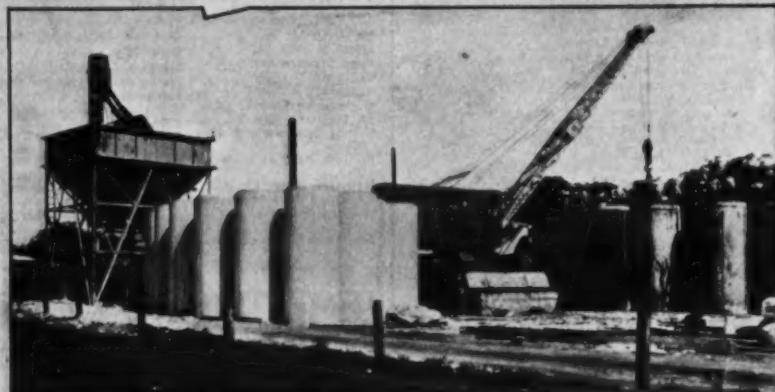
Contractors and Engineers Monthly



A DIESEL TRACTOR OWNED BY
EL PASO COUNTY, COLO., AT WORK IN
BLACK FOREST, NORTH OF COLORADO
SPRINGS
SEE PAGE 11



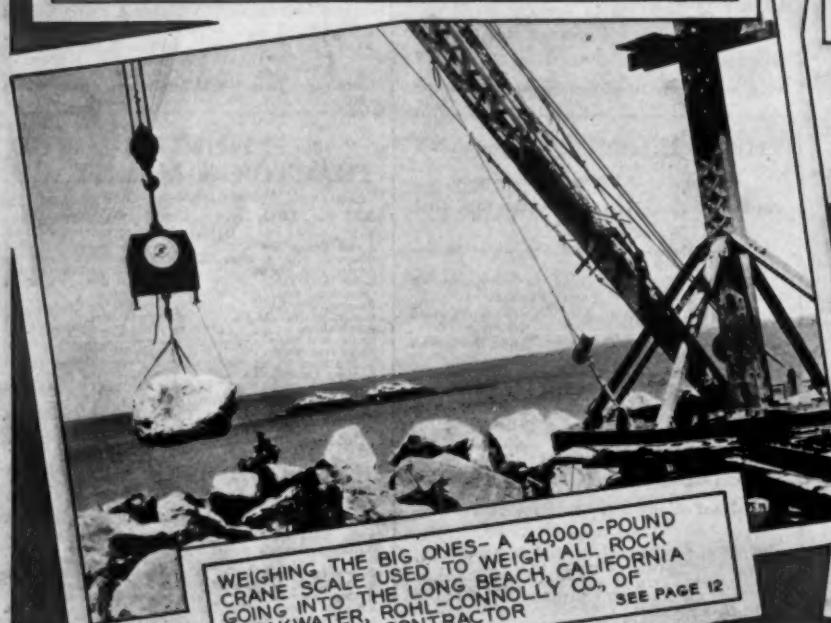
A 10-YARD MONIGHAN LOADING A
40-YARD TRUCK BUGGY AT
BONNEVILLE, OREGON SEE ALSO PAGE 12



THE PIPE CASTING YARD OF THE LOCK JOINT PIPE CO.
FOR THE NEW 19,000-FOOT CONCRETE PIPE LINE AT NEW
BEDFORD, MASSACHUSETTS
SEE PAGE 1



THE PILE CASTING YARD AND 25-TON GANTRY OF 70-FOOT
SPAN USED BY KELIHER CONSTRUCTION CO. OF DALLAS, TEXAS,
FOR POURING AND HANDLING THE 75 TO 90-FOOT PILES FOR
THE BONNET CARRE SPILLWAY HIGHWAY BRIDGE NEAR NEW
ORLEANS, LA.
SEE PAGE 2



WEIGHING THE BIG ONES - A 40,000-POUND
CRANE SCALE USED TO WEIGH ALL ROCK
GOING INTO THE LONG BEACH, CALIFORNIA
BREAKWATER, ROHL-CONNOLLY CO., OF
LOS ANGELES, CONTRACTOR
SEE PAGE 12



DIAMOND PORTABLE UNIT CRUSHING 300-TONS
OF COBBLESTONES IN 12-HOUR DAY WITH 44-
HORSEPOWER DIESEL TRACTOR FOR POWER.
FUEL COST 9 CENTS AN HOUR, CRUSHER OWNED
BY RIO BLANCO COUNTY, COLO.



BANTAM BATCHING OF CONCRETE FOR THE
RAILROAD SPAN OF THE PENSACOLA, FLA.,
OVERHEAD CROSSING BUILT BY C.G. KERSHAW
CONTR. CO. OF BIRMINGHAM, ALA. SEE PAGE 10



PRECARIOUS PERCHES FOR
WELDERS ON THE
NEW HALF MILE PIER
BUILT BY MERRITT-
CHAPMAN & SCOTT
FOR THE SANTA CRUZ
PORTLAND CEMENT CO.,
AT DAVENPORT, CALIF.
SEE PAGE 2

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